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ALL old friends and subscribers will be glad to know that Mr. H. M HOWE'S work on the "Metallurgy of Steel," now being published weekly in these columns, is meeting with a reception fully in accordance with our most sanguine expectations.

From all parts of America and from every country in Europe, each mail brings us letters in eloquent testimony of the author's reputation, and commendatory of our own enterprise in undertaking such an important publication. As it would be quite impossible for us to reply individually, to all our correspondents, we beg them to accept this general expression of our cordial thanks, and assure them that no effort will be spared to make the ENGINEERING AND MINING JOURNAL still more indispensable to them in the future than it is now.

WITHOUT any desire at this moment to discuss the merits or defects of superphospates, we think it may probably interest some of our readers to know of a process lately patented in Germany by Messrs. HAENISCH and SCHROEDER, for the manufacture of precipitated phosphates from any kind of the ordinary crude rock.

The rough material being first reduced to a very fine powder, is treated with just sufficient sulphuric acid to transform the carbonate and any free lime into sulphate. The mass is then subjected to the action of aqueous sulphurous acid, which dissolves only the tri-calcium phosphate and leaves the other constituents as a sediment.

The clear liquid is decanted and subjected to a gentle heat; sulphurous acid is given off and reabsorbed in water—by means of a simple mechanical device—the phosphate itself being precipitated washed, dried, and passed through a disintegrator.

The preliminary treatment prevents the combination of the carbonate or free lime which would otherwise take place with the sulphurous acid, and averts the formation of a mixture of calcium sulphite in the final product.

WHAT are we to do with our sons? is a problem by which the paternal mind is continually agitated; nor does it, singularly enough, become any the more easy to solve, when the preliminary schooling of the youngsters has prepared them for the serious studies, necessary to qualify them for a technical career.

Besides the men of profession, the world is already overcrowded with professional men, the vast majority of whom are neither eagles, nor inventors of gunpowder. To the number of these mediocrities, the various schools are daily making their additions, and hence it is that thousands of lives are frittered away in obscure positions, or spent in a perpetual struggle for mere existence.

It is unfortunate that, to a certain extent, this state of affairs must ever prevail, for there will always be men of mistaken vocation, persisting in attempts to do things for which they have no aptitudes; but it is no less true that a great amelioration may be induced, by encouraging in the students of every profession, the cultivation of some definite branch.

As soon as we have more specialists, there will be a greater diversity of work, and a greater division of labor, for every man will stand upon his merits. All things will be better done, because better understood, and there will be more discoveries, fewer mistakes, and fairer remuneration.

THIS is an age of competition. The winner of the race must be fleet and strong, bold and venturesome. The puny and retiring stand no chance of emerging from obscurity. We are living at a high pressure, rapidly improving our means of transit, intercommunication, and exchange, with all kinds and conditions of men; so developing our understandings by our new educational systems, and so increasing the range and number of our daily wants, that innumerable objects, regarded as superfluous luxuries by our forefathers, have now become, by some natural process, necessities of our daily lives.

Telephones, torpedoes, twin screw steamers, liquid fuel, Bessemer steel, and natural gas, are a few of the signs that mark a generation, in which our bread, if not hurriedly gathered up, is snatched away by other outstretched fingers, and in which every false step is a lost opportunity. Work and wealth! Capital and labor! These are the two forces which, harmoniously blending, have brought us where we are, and which, in the natural order of things, must ever, under proper regulations, go hand in hand.

The members of a primitive society cultivated the land, and made it produce more than was necessary for their daily wants. Those who stored up the surplus became wealthy, wealth bringing them leisure, study, civilization, empire. Circumstances change, but men remain the same, and there will consequently ever be a class active and frugal, and a class of extravagant idlers.

The first will accumulate riches and power, the latter remain in poverty and servitude. When labor co-operates, capital combines, and, after a momentary ebullition—a frantic outburst of pent-up rage—a ventilation of grievances, imaginary and real, the sinew, and brawn, and brain, invariably come back to the cash-box and say, "Give us bread, lest we die!"

TOO MUCH ENTERPRISE.

Omniscience is the foible of the daily press. There is nothing dearer to it, except, perhaps, the appearance of omniscience. The possession of the real article might impose onerous responsibilities; but the *simulacrum* is very handy. And if there is any thing which the parties concerned do not desire to make public, that is the very thing which a truly enterprising newspaper must profess to know.

People are frequently at a loss how to deal with the ubiquitous and inquisitive reporter, and sometimes (though it is both a wicked and a hazardous business) they "stuff" him. It is not often, however, that after being thoroughly stuffed he is put on exhibition. An illustrious instance of this rare occurrence was furnished a few days ago.

On Saturday, April 23, the Philadelphia *Press* beat all its contemporaries with a report of what it called the meeting of the "National Bridge Builders' Association." That there is no association in existence under that title is an unimportant matter of detail. That the list of eminent gentlemen named as present could not by any possibility have come together as representing the bridge manufacturers of the country, is

another trifle. But these introductory features were in perfect harmony with the report of the proceedings, which is as follows :

"Mr. —— presided and Mr. —— was secretary. A report was made by these gentlemen on the Bussey bridge disaster, near Boston. They believed that the bridge had never been properly stiffened ; had found that the original erection was faulty ; that the parallel rods were put in the wrong positions, the effect being to reverse the design of the bridge, throwing the compression into the top chords and the tension into the bottom chords, when the reverse should have been the case. No provision had been made, either, to prevent longitudinal motion of the bridge when air-brakes should be put on in crossing.

"The matter of the Inter-state Commerce Bill was informally discussed, and the opinion was freely expressed that the railroad companies were taking advantage of it to demand exorbitant rates.

"Another question considered was the comparative merit of hot and cold blast in the manufacture of bar iron and steel.

"Probably the most important matter, however, that came up, was that of specifications. The car-builders of the country some time ago adopted specifications of their own independent of those of the railroad companies, and these were afterwards adopted by the latter. The bridge builders have already adopted these specifications, and reports showed that contracts based upon them are gradually being accepted by the railroad companies. It was the general opinion that the requirements were too high for the moment of inertia.

"Mr. —— strongly urged that the builders disregard the moment of inertia and substitute for it the formula for radius of gyration. The prevailing inclination was strongly in favor of this change, and it was practically decided to make it. ——— and ———, however, were appointed a committee to consider the point more fully. The understanding was that the committee should call another meeting when they were ready to report."

The intelligence and *vraisemblance* of this report staggers criticism and beggars admiration. We have suppressed, in reprinting it, the names of the distinguished experts mentioned. It might make them too proud to give them full credit for the views ascribed to them, and people who hold such views really ought to be modest, as becomes true originality. Besides, there remains the haunting thought that these persons were not present, did not boldly propose to substitute the radius of gyration for the moment of inertia, and might sue us for libel (so perverse are the minds of some men !) if we attributed such revolutionary sentiments to them. We must confess that the proposed use of the radius of gyration would be revolutionary ; if it does not actually postpone our moment of inertia, it seriously shakes our center of gravity.

The adoption of the car-builders' specification, is another bold proposition; and the explanation of the Bussey bridge disaster is too good for ordinary use. It ought to be saved for a jury, and illustrated with models, parallel bars and all. As to the comparative merit of hot and cold blast in the manufacture of bar iron and steel, it is a thousand pities that the mind which conceived this question did not also furnish the answer. What is the good of agitating the technical world with such thoughts, only to leave it, in its perplexity, to go on making bar iron and steel without any blast—thus paralyzing, as it were, a great industry ?

There is a rumor about that there *was* a meeting in Philadelphia, week before last, of the "American Bridge Manufacturers' Association ;" that the topics discussed were of private business only ; that reporters were not admitted, and that the astonishing revelations made by the *Press* are the result of a practical joke played upon its too persistent representative. We do not vouch for this report, but we must confess that it has a certain air of probability. If it be true, it suggests to the conductors of daily papers the advisability of combining with extraordinary enterprise, ordinary intelligence.

CORRESPONDENCE.

[We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.
All letters should be addressed to the MANAGING EDITOR.
We do not hold ourselves responsible for the opinions expressed by correspondents.]

Calumet & Hecla Mining Company.

EDITOR ENGINEERING AND MINING JOURNAL :

SIR : I have read with great satisfaction in your journal of April 16th, 23d and 30th, the remarks made in reference to the acts of the Calumet & Hecla management, and am glad that somebody has had sufficient courage to come to the front and try to protect the stockholders of the minority.

It seems after all, that shareholders have no rights whatever, if the trustees hold the controlling interest. A stop must be put to such management, and I for one would be only too glad to contribute towards defraying the expenses of any suit, to compel the trustees to render full reports. The Calumet & Hecla trustees govern rather more autocratically than the Emperor of Russia. Yours respectfully,

NEW YORK, May 4, 1887. SHAREHOLDER.

A Coke Battery.

EDITOR ENGINEERING AND MINING JOURNAL :

SIR : If a piece of coke be placed in a solution of an alkali permanganate, the latter is gradually reduced. If a little H_2SO_4 is added to the solution, the action is more rapid. If the action takes place in a porous vessel surrounded by water, a galvanic current is generated and the coke is negative, giving the positive electrode at the end of a connected wire. Another piece of coke in the water, with wire attached, gives the negative electrode at its terminal.

If the water be acidulated, the current is stronger, remaining in the same direction. If the water is made alkaline the same result is obtained. A piece of cloth, wet twine, or the finger in the water, conveys the current the same as a piece of coke, but the other coke plate can not be thus replaced. With acidulated water, or a solution of alkali carbonate in the outer compartment, the action soon ceases with a coke plate ; but if the plate be removed, heated, (to redness or less) and replaced, action is renewed for a time. With a solution of sodium sulphite in the outer compartment, action is continuous and strong, but the best liquid so far found, is a solution of alkali polysulphide.

This solution affords the strongest current, and action continues very steadily until the permanganic acid is decolored.

A single cell decomposes well-water slowly, acidulated water rapidly ; it also dissolves and redeposits copper in the proportion of 1·7 parts to 2 parts of potassium permanganate. The solution of polysulphide is not much, if at all, changed in a green glass jar and in presence of plenty of coke, being to a great extent protected from atmospheric action.

An alkaline solution of a manganate is deoxidized, but yields no current. Sulphuric acid in place of permanganate gives a current, but soon ceases action. Some other solutions give similar results, especially hypochlorites, but none are so far equal to a permanganate. The current is always in the same direction; but a metal, as lead, zinc, or iron, in the outer compartment, whether in acid or alkaline solution, becomes an active positive.and I think it tends to retard or prevent reduction of the permanganate in the other compartment. Dr. Eisenmann's solution of tungstic acid gives a current and is blued in the process to some extent, though not to the same extent, as by zinc. This solution is not blued by coke *per se*. Reoxidation of the liquid by exposure did not give satisfaction. Dilute nitric acid and alkali (or calcium) polysulphide, with two pieces of coke, give a good current, the coke in the acid being negative. An interesting fact, whether before known or not, is that in this case a large proportion of the acid is converted into ammonia. As to the utility of these data, I think the battery with permanganate may be useful, as it is cheap and gives off no sensible fumes. C. H. AARON.

APRIL 20, 1887.

P. S.—Since writing the foregoing, I have found that, when the fluids used are dilute nitric acid and a polysulphide solution, the coke is not necessary, two platinum tipped wires dipping into the liquids answering the purpose. Permanganic acid does not give this result.

C. H. AARON.

April 25, 1887.

TRI-SODIUM PHOSPHATE AS A WATER PURIFIER.

By W. J. Williams, F.C.S.

This chemical compound is now being extensively brought into notice by the Keystone Chemical Company, of Philadelphia, as a scale preventive. As is well known, the scale-forming matter in water, consists chiefly of lime sulphate, and carbonate, and magnesia carbonate, and hydrate, which are thrown out of solution by evaporation, and, falling as a dense crystalline precipitate, burn on to the iron in thick hard scales. These scales are very bad conductors of heat : a scale $\frac{1}{16}$ of an inch thick requires the use of 15 per cent more fuel, $\frac{1}{4}$ of an inch, of 60 per cent more, while if it reaches a thickness of $\frac{1}{2}$ inch, the fuel must be increased by 150 per cent, and so on. It is hence apparent that to all manufacturers and all users of steam, any method of preventing this incrustation is a great desideratum.

The use of tri-sodium phosphate for this purpose, has hitherto given the most undoubted proofs of its value. Nearly all the other scale removers in the market depend on their power of *dissolving* these lime and magnesia salts, and it is reasonable to conclude that if they will dissolve such a refractory substance as boiler scale, they will also attack boiler iron. This attack may be, and often is, gradual and slow ; but it is none the less certain, though insidious.

That tannic acid is destructive to boilers we have a practical proof in such peaty waters as are found in Florida, where the tannic acid formed in the water from the decayed vegetable matter actually corrodes the boilers to such an extent that in many cases copper tubes have been substituted for iron. Caustic soda is certainly effective in some cases, though the seams, rivets, and boiler shell, suffer badly from its solvent power, its affinity for sulphur causing it to eat out minute pin holes in the metal. Unlike any of these agents, the efficacy of tri-sodium phosphate is due to its faculty of *decomposing* the sulphates, and carbonates, of lime, and magnesia, and forming in their stead, lime and magnesia phosphates, and soluble sulphate, and carbonate, of soda.

The following equation will give a general idea of the reaction induced :

$$3\,(CaSO_4) + 3\,(MgCO_3) + 4\,(Na_3PO_4) = Ca_3P_2O_8 + Mg_3P_2O_8 + 3\,(Na_2SO_4) + 3\,(Na_2Co_3)$$

The solid lime and magnesia phosphates are not dense, crystalline precipitates like the sulphates and carbonates, of which they take the place, but are light and flocculent, remaining equally distributed throughout the water as long as it is in ebullition and only settling down when the water is perfectly quiescent. Even when this precipitate does settle, it is in such soft, gelatinous condition that it can not burn on to the iron unless the water is first evaporated quite away ; an impossible condition.

Tri-sodium phosphate reacts equally well on metallic salts, such as copper and iron sulphates and carbonates, precipitating the copper and iron as phosphates, and leaving sulphate and carbonate of soda in solution.

In cases where free acid is present in the water, as tannic acid in Florida, or sulphuric acid in the drainage of many mines, it will be neutralized by the alkaline tri-sodium phosphate, and the water thus be rendered harmless.

Lastly, as tri-sodium phosphate does not itself act deleteriously upon iron, no ill effects beyond the waste of the substance will follow its excessive use.

The Bessemer Steel Company vs. Jacob Reese.—In the long pending suit between the Bessemer Steel Company vs. Jacob Reese, of Pittsburg, Pa., over the rights of possession of forty-two patents covering what is known as the "Basic" process of steel manufacture, Judge Stowe, of the Court of Common Pleas, at Pittsburg, handed down an opinion on the 23d inst., giving to the plaintiffs, the Bessemer Steel Company, the entire rights to the whole process. The amount at stake in this case, and the litigation, covering a period of nine years, have made it of great interest to the steel world, the more so as Reese recently obtained a United States Supreme Court verdict in his favor. The present case, however, takes cognizance of the fact that Reese endeavored to retain certain patents contrary to a sweeping agreement with the company.

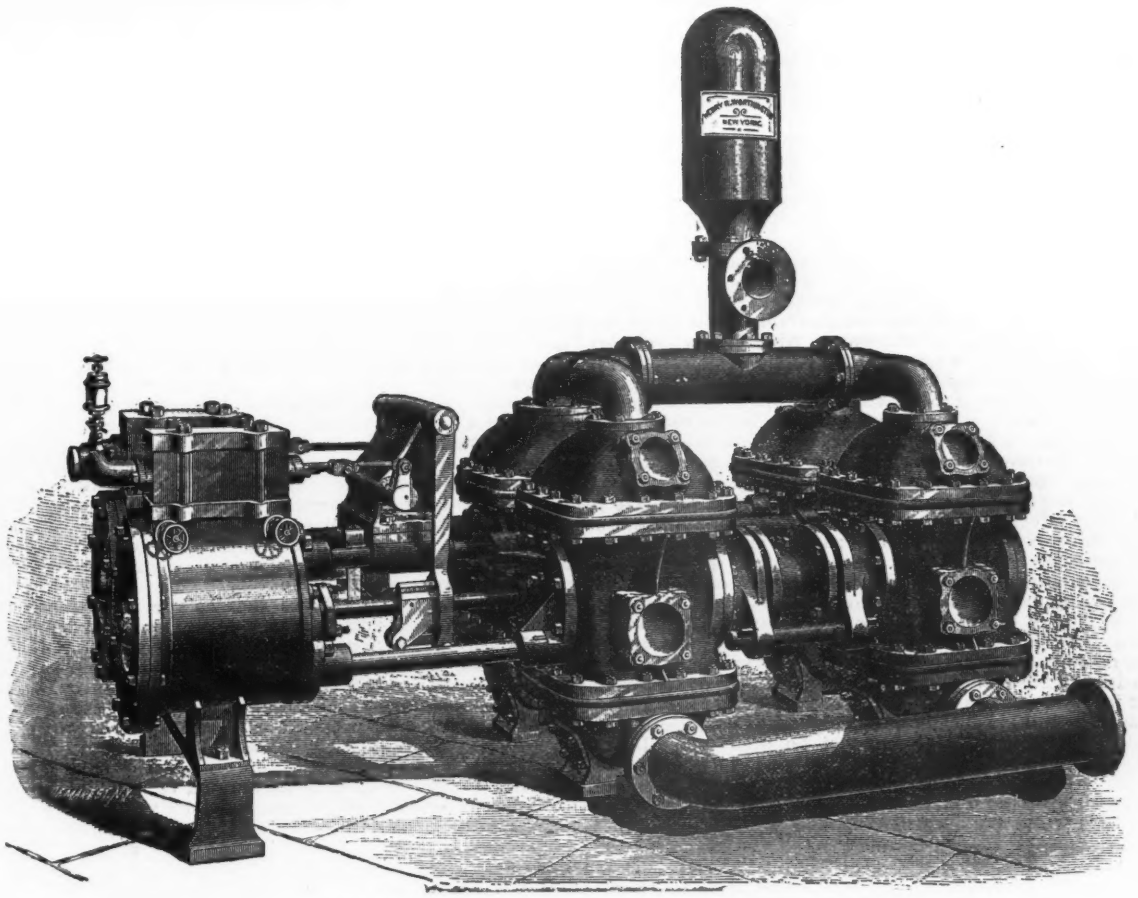
THE WORTHINGTON MINE-PUMP.

It is a very difficult matter to design and construct a steam-pump that will satisfactorily meet the exacting requirements of mine-pumping. The service is generally rough, severe, and continuous. Great care must be exercised both in the selection and adaptation of the material used in construction, as the water to be pumped is often of a kind that will attack and quickly destroy it. The location of the mine is usually remote from supplies, and any necessity for renewals or repairs, unless they can be made with unskilled labor and with little delay, may be attended with serious consequences.

These considerations, therefore, demand that a mine-pump should be extraordinarily durable, simple, and efficient, and have led to the construction of the form of Worthington pumping-engine shown in our illustration.

The plungers of this machine work through central, exterior stuffing boxes, into four separate and distinct water cylinders, These cylinders are all precisely alike, sub-divided as much as possible, and having each part or attachment of the one the exact duplicate of the corresponding part or attachment of the other three; so that not only can either one of the four cylinders be substituted for any other, but any part of any one can be substituted for the corresponding part of any other.

The valve areas and water ways are unusually large in proportion to the displacements of the plunger, so that the velocity and consequent destructive action of the water currents is decreased.



THE WORTHINGTON MINE PUMP.

It will be noticed that the supply pipe can be placed either side of the pump, or turned either way.

The discharge tee can also be turned in any direction.

The pumps are designed to safely withstand a working pressure of 300 pounds to the square inch, and all their attachments are especially strengthened with a view of meeting the rough usage and hard work to which, in this service, they are liable to be subjected.

Mr. J. Douglas, Jr., President of the Copper Queen Mining Company of Arizona, has lately purchased for that company one of these machines, which has the capacity of delivering about 500 gallons of water per minute to a height of 500 feet.

In view of the high price of fuel in that locality, the pump in question was fitted with compound steam cylinders, as this form of a machine will effect a saving of about 30 per cent in the amount of coal that would be required to run an ordinary high-pressure pump performing the same work.

During a test, made at the works of the builders, Henry R. Worthington, New York City, this machine was run at the rate of 120 feet piston speed per minute against a water pressure of 300 pounds per square inch.

The entrance examinations for the Massachusetts Institute of Technology will take place in June, and for the convenience of applicants the Institute has arranged for examinations to be held in New York, Philadelphia, Montreal, Q., Chicago, and a number of other places. Application for particulars should be made to James P. Munroe, Secretary, Mass. Inst. Tech., Boston, Mass.

INTERNATIONAL CONGRESS OF GEOLOGISTS.

A meeting of the American Committee elected to represent American geologists in the above Congress, was held in Albany on April 6th, and was well attended. The secretary announced that there had been forty-five subscribers for fifty copies of the geological map of Europe.

A motion was adopted abolishing the Committee of the Whole and its officers, and intrusting the duty of preparing reports on the separate divisions of the geological column, to eight reporters, who were thereupon unanimously elected. The following was adopted by the committee:

Resolved, That we recommend to American geologists the acceptance of the conclusions of the International Congress; said changes to be formulated at a subsequent meeting of the Committee; and it being understood that the Committee will present such additions as are deemed necessary by American geologists to the Congress of London in 1888.

The reporters named were:

Quaternary, Recent, Archæology, Major Powell, Dr. U. S. G. S., Wash'n, D. C.

Cainozoic (Marine), Prof. E. A. Smith, State Geol. Univ., Ala., Tuscalossa.

Cainozoic (Interior), Prof. E. D. Cope, 2102 Pine st., Philadelphia.

Mesozoic, Prof. Geo. H. Cook, State Geol., Rutgers C., New Brunswick, N. J.

Upper Palæozoic. Carbonic, Prof. J. J. Stevenson, Un. City of N. Y., N. Y.; Devonic, Prof. H. S. Williams, Cornell Un., Ithaca, N. Y.

Lower Palæozoic, Prof. N. H. Winchell, St. Geol. Un. of Minn., Minneapolis.

Archæan, Dr. Persifor Frazer, 201 South 5th st., Phila., Pa.

Each of these gentlemen is to obtain for his own subject, the completest possible information from all sources. They all, therefore, unite in soliciting co-operation, suggestions, or advice, from any of their professional brethren having convictions as to classification, nomenclature, coloration or any of the numerous subjects brought before the last, or likely to be discussed at the next Congress. We trust this invitation will be generally and generously accepted, in a proper spirit.

Basic Slag as a Fertilizer.—The grinding of basic-steel slag for agricultural purposes is being carried on at the works of the Staffordshire Steel and Ingot Iron Co., at Bilston, England, with an energy which speaks eloquently of the favor with which farmers are receiving this material. The machinery used is very similar to that employed for grinding apatites, and the process is divided into three stages. The slag, which contains about 20 per cent of phosphoric acid and 40 per cent of lime, is first fed into the preparing mill in its rough state and is reduced to about 3-16th inch, and any pieces of steel exceeding that dimension accumulating in the mill are taken out, generally about once an hour. During this primary reduction a quantity of fine material is produced, and is extracted by the Wood's Patent Separator before the reduced material passes to the second stage, in which a magnetic separator extracts the small pieces of steel. The last stage completely pulverizes the slag, making it of such a fineness that it will pass through a mesh of 10,000 holes to the square inch, for the value of the material as a fertilizer depends, as we have already pointed out, upon its impalpability. From the rough slag to the finished powder the process is continuous, and the feed automatic.

THE USE OF REFINED SLAG IN THE MANUFACTURE OF GLASS.

Written for the Engineering and Mining Journal by A. D. Elbers.

The technical value of refined slag is mainly due to the circumstance that its constituents are so chemically combined as to more energetically promote the fritting and the fusion of mineral compositions than is the case when they are combined in different proportions, or when they are not in previous combination. *Singulo or monosilicates*, so called, on account of the quantitative relations in which the silica stands to the basic components, can not be produced by direct methods, at least not for manufacturing purposes, but are produced in an impure condition, and in immense quantities, *as refuse or slag*. When such slag has been freed from the characteristic impurity, sulphur, which so greatly impairs its usefulness, and from matter which is not in constitutional connection, it becomes *refined slag*. The monosilicate constitution, as applied to the principal ingredient of the slag is, in round figures, 35 per cent of silica and 65 per cent of lime, but when other bases are present besides lime, such as magnesia (MgO) and alumina, as is usually the case, the total silica of the refined compound is, in the average, nearer to 39 per cent.

The natural monosilicates of an approximating composition have either a large percentage of alumina, and then are not energetic fluxes, or have so much iron in combination that their use as a flux is restricted to the manufacture of those products in which such impurities are not objectionable. The peculiar advantage which can be derived from the use of a non-alkaline monosilicate flux, when it is sufficiently pure for such productions as that of colorless glass, or of white china, is therefore not readily inferred from the behavior of any of the raw materials which have been thus far known, and much less so from the behavior of the crude slag in its vitiated sulphurous condition. The sulphur assists the formation, but also blunts the saturating energy of the formed slag, which is very fortunate for the lining of the furnaces in which the slag is produced, for refined molten slag makes very short work of the most approved fire-brick, unless it finds some other silicious substance to act upon.

For the purpose of illustrating the proper functions of refined slag, the composition of good window glass affords an example. Such glass contains about 70 per cent of silica, 13 per cent of lime, and 17 per cent of alkalies and incidental admixtures; its hardness and elasticity, as well as its resistance to acids, increase with the percentage of the silica and, as against alkaline and metallic bases, with that of the lime; but the refractoriness of the raw composition or *batch*, and the expense of melting or *boiling* it properly, increase in a similar ratio. These difficulties are lessened to some extent when the lime and a part of the silica—sand or pulverized quartz—which enter into the composition of the batch, are already in chemical combination, as, for instance, when the natural bisilicate *Wollastonite* is used, which contains about 52 per cent of silica to 48 per cent of lime. The Wollastonite can be used in the above glass-composition without raising the lime of the latter *above* 13 per cent, to the extent of about 27 per cent, and the refined slag can be used in the same manner to the extent of from 20 to 22 per cent. The Wollastonite, however, though it melts quicker than quartz and lime, is more sluggish in the melted state, and does not assimilate readily with the rest of the melted mass, whereas the refined slag reacts so energetically that 5 to 10 per cent of it has more effect on the state of fusion and assimilation of the total mass than 27 per cent of Wollastonite; or, to express it in another way, the same quantity of a compound, consisting of 13 parts of lime and 7 *parts* of silica, can dissolve *more than twice as much* of silica as that of another, which is composed of 13 parts of lime and 14 *parts* of silica.

This saturating energy of the *monosilicate* is similar to the *force of motion* by which a stone can be broken with *one* blow, when two strokes of half the power could not break it; for the bisilicate compound, which is obtained by melting refined slag and quartz, is just as sluggish in its behavior when it is remelted with more quartz, or with other ingredients of the glass batch, as natural bisilicates of corresponding composition.

For economical reasons, refined slag can not be used to any larger extent for the composition of ordinary glass batches, in which crude and cheap alkalies are employed, than that in which its efficiency for reducing the expense of the *process of boiling* is an equivalent for its cost, and that proportion will, presumably, not average above 5 per cent; but in compositions in which it can be used to replace, in part, refined alkalies, borates and oxides of lead, which exceed its cost by from fifty to four hundred per cent, its substitution to the fullest possible extent, is as well a question of economizing in first cost, as of improving the quality of the ware it is destined to produce. These replacements are of especial importance in glazing and enameling pottery, which, being used for culinary purposes, is liable to become corroded by the action of fatty acids; but, apart from this, the fritting energy of refined slag makes it particularly serviceable in pottery manufacture. It induces a more thorough combination of the usual components of the bodies, from the finest porcelain down to fire-brick, by less firing, and in new and more advantageous proportions. These facts have all been experimentally tested and approved by leading practical manufacturers in almost every branch of the industry.

The only theoretical objection which can be made to the use of refined slag in the manufacture of glass is, that glass which contains *several* non-alkaline bases is, usually, more liable to devitrify than that which contains only *one*, and that this multiplicity of bases would be introduced with the refined slag, which contains lime, magnesia, and alumina. The results of many tests which have been made in that direction—the compositions having been melted in a procelain kiln in which they had to cool very slowly—do not indicate that magnesia and alumina, in those small proportions in which they are thus introduced, have any such tendency, nor is it quite certain that devitrifaction in general is owing to the nature or *kind* of the substances which have been combined, rather than to the *state of combination* in which the substances were, *before* they became absorbed in the new compound. It is certainly evident that the magnesia and alumina of the monosilicate must assimilate more thoroughly with the mass, than the same substances do when they are derived from a sluggish compound, or from one which only dissolves at a more advanced stage of the boiling.

HOBOKEN, New Jersey, May, 1887.

THE GASEOUS FUEL PROBLEM.

By H. Q. Hawley.

We may justly assume that the world is ready for gaseous fuel, and will use it generally as soon as it has proof that such use is practical for large as well as small purposes of heat—the real issue in the solution of the gaseous fuel problem.

Unfortunately for that solution, there is small encouragement while the gas companies regard it as they do. Whether from the inertia into which great corporations fall when their profits are large, or from lack of faith, we can not say, but it is certain that the gas companies treat the fuel question as they did the light question until competition forced them into its improvement. That is, they accept it with all its defects and without taking into consideration the laws governing combustion, to wit:

The advantageous combustion of gaseous fuel is only possible when its air supply is so regulated that not only at ignition but thereafter its combustion will be kept at the high temperature required to consume its products.

When combustion takes place in air, its fuel product is carbonic dioxide only when the air supply is sufficient for the formation of that gas, and when it is not, the product must be carbonic oxide.

Now apply these laws to the methods in general use for burning gaseous fuel, beginning with what is known as the Bunsen system, always used for carbureted gas.

This system consists in mixing air with the gas to be burned previous to its ignition, in the proportion of 2 to 3 parts air to 1 of gas, and in burning them together from pipes perforated at or near their upper surface, and so placed in an open case, that only part of the air passing through it can come into contact with said pipes, the remainder passing around and away from them.

In the first place, from the small amount of fuel in the mixture burned, and no provision made for heating it previous to ignition, its combustion commences wrongly, as, the less fuel in flame at ignition, the less heat in it thereafter.

Secondly, without taking into the account that when gas mixed with air previous to its combustion is burned the affinity of its carbon for oxygen must be lessened, it is evident that the air supplied to a Bunsen flame at ignition is but a fraction of what is required for combustion, and therefore that its product at that point (other, of course, than nitrogen and vapor of water) must be CO; and thereafter must largely remain CO to pass off as waste.

Thirdly, the burner pipes in a Bunsen stove being in the center of its open case, much of the air passing through it must pass around and away from its flame, whereby the heat saved from the waste above described, must be further diluted, and, therefore, reduced before it can be used.

Fourthly, that as the makers of Bunsen stoves now advise that they should not be used without a flue to the chimney, to carry off the products of combustion, they admit (1st) that said products are poisonous; and (2) that as a flue to the chimney to be efficient must make draught enough to overcome the retarding influence of open cooking places, its use when they are closed is not practical, from the excessive waste it would cause; and, therefore, that cooking by a Bunsen stove, however it can be temporized with while intermittent and confined to open places, will never be tolerated when gas is the only fuel used, and therefore the poison will be in excess.

From all which it follows that as the main factor in solving the problem of gaseous fuel is its economical combustion for large uses of gas (heating boilers for steam, furnaces for warming houses, etc.), that problem can never be solved until not only the Bunsen system, and the apparatus used for it, but also burning the gas through broken brick, a still more wasteful method for causes too evident to require explanation, are abandoned, as their operation, while not satisfactory for small uses, permitting little draught, is too wasteful to be used for large ones, where draught is a necessary condition; and that such conclusion applies whether the gas burned is carbureted or fuel water-gas, as the same apparatus is used for both gases—the only difference in its operation being that in the stoves used for fuel water-gas, the gas is burned in a pure state, while in a Bunsen stove it is not—and, when it is in stove form, is always constructed to keep down instead of regulate the draught.

Finally as the gaseous fuel problem is not whether gas can be made as cheap a fuel as coal absolutely, but near enough to it in cost and value to be preferred to it, when convenience, luxury, and its use in the arts are taken into the account; and that its value even as now burned is so near that of coal for many uses; it is a reasonable inference that it will be preferred to coal for most uses when it is burned in apparatus operating in accordance with the laws governing combustion.

In the opinion of scientific men, it is becoming more probable every day that, while carbureted gas answers for small uses, fuel water-gas alone is adapted to large ones, and therefore will be the fuel of the future. Its value, much more than carbureted gas, depends upon its combustion being protected from cold air dilution, and therefore, as it is not burned in that way, it has always been underestimated, being assumed to be only one half instead of two thirds the value of carburetted gas, as, to the writer's knowledge, is found to be the fact when it is properly burned.

In connection with the low cost at which fuel water-gas can be sold, and its better adaptation to manufacturing purposes, it would appear to be for the advantage of existing companies to furnish it even at the cost and care of separate mains and meters; and this may become a necessity in case its use with the magnesia incandescent burner should be successfully introduced here as it is in many places in Europe. As fuel water gas can be made at so trifling a cost from refuse coal, it only requires a practical way of conveying it for long distances to secure its general use in all cities not too far from where such refuse can be had—an inference which will also apply where natural gas is so conveyed, when its supply is exhausted, as it must be in time, and the mains used for it go to where fuel water-gas can be cheaply made.

BERGEN POINT, April 11, 1887.

RAIL SECTIONS.*

By W. F. Mattes, Scranton, Pa.

(*Continued from page* 312.)

The second question which I have undertaken to discuss relates to the wear of rails, and the treatment must be partly empirical.

The dynamic force called into action is represented by MV^2, in which M is a constant, because it is a function of the tonnage, for which we have assumed a common unit. Hence, other things being equal, the force which produces abrasion varies as the square of running speeds.

We may liken the wheels to a chisel, which, being struck by a hammer of given weight, produces an effort which varies as the square of the velocity of the hammer-head. But we may also vary the effect by a change of chisels. It will make a difference whether the force of the blow is confined to a sharp edge, or distributed over the larger surface of a blunt one; and so it will make a difference in the abrasion of rails, whether the given tonnage be distributed over many wheels, or concentrated upon a few. Hence, observers have sought to ascertain the relation that exists between wheel-loads and wear.

In the discussion on steel rails at the February meeting of 1881 (Vol. IX. of *Transactions*), Mr. Ashbel Welch remarked upon Dr. Dudley's observations of wear: "In this case, the wear per ton of gross load increased as the 0·6 power of the weight on a wheel. With iron rails in former years, it increased much faster than this rate. As machinery becomes heavier it will doubtless increase faster with steel. As the same engines and tenders with the same weights on a wheel passed over each track, and as the speeds were probably greatest on the light track, the difference in wear due to difference in weight on the freight-car wheels, was probably greater than above estimated." Mr. Welch also says, in a report to the Civil Engineers, May 5th, 1875, in reference to the width of rail-heads: "But the endurance of injury from the pressure of a given weight on the top is, under some, perhaps not very unusual, conditions, as the square of the surface compressed." This is the same thing as saying that the suffering of the rail is as the square of the wheel-load.

Here, then we have a warrant upon high authority for believing the wear to increase in some power of the wheel-loads greater than 0·6. As a move in the right direction, while yet keeping a conservative figure, I have taken it in the following calculations at 0·8. The tonnages, which are for one day in each year, have been compiled with official assistance. In the wheel loads for 1887, it is assumed that all freight and coal is carried upon cars of 50,000 pounds capacity, a consummation not yet realized. The method of calculation is to multiply the number of wheels and drivers of each class by the 0·8 power of their respective loads and the square of running speeds. The sum of these products represents, for comparative purposes, the rate of abrasion; and by dividing the sum for 1887 by the ratio between tonnages for the two years, we obtain a basis for comparison upon a unit of tonnage.

1876. DELAWARE, LACKAWANNA & WESTERN RAILROAD, SOUTHERN BOUND TRACK.

Passenger Trains.—	8 drivers ($14{,}000^{\cdot 8} \times 30^2$) =	14,936,000
	88 wheels ($6{,}000^{\cdot 8} \times 30^2$) =	83,415,000
Freight Trains.—	28 drivers ($11{,}600^{\cdot 8} \times 12^2$) =	71,959,000
	444 wheels ($5{,}000^{\cdot 8} \times 12^2$) =	58,066,000
Coal Trains.—	264 drivers ($11{,}600^{\cdot 8} \times 10^2$) =	23,976,000
	44 wheels ($5{,}000^{\cdot 8} \times 10^2$) =	3,996,100
	3859 wheels ($4{,}600^{\cdot 8} \times 10^2$) =	328,610,000
	Total	584,958,300
Tonnages in pounds.—	8 drivers × 14,000 =	112,000
	292 drivers × 11,600 =	3,387,200
	88 wheels × 6,000 =	528,000
	488 wheels × 5,000 =	2,440,000
	3859 wheels × 4,600 =	17,751,400
	Total	24,218,600

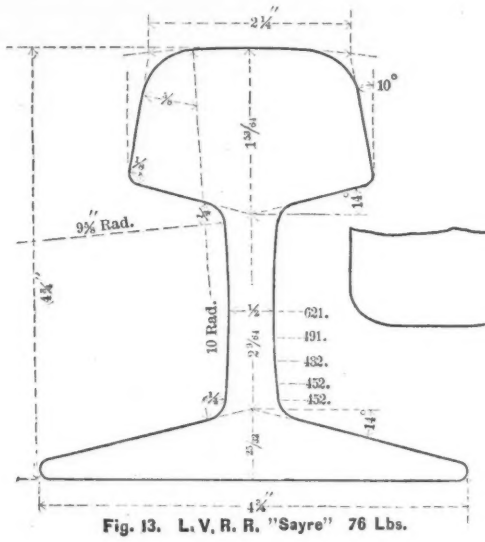


Fig. 13. L. V. R. R. "Sayre" 76 Lbs.

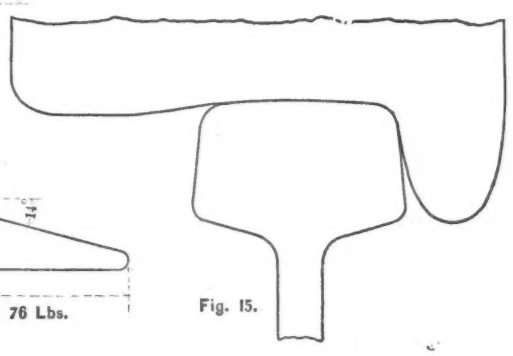


Fig. 15.

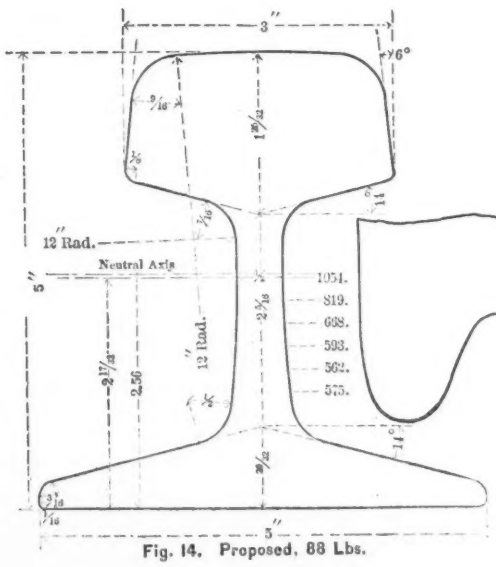


Fig. 14. Proposed, 88 Lbs.

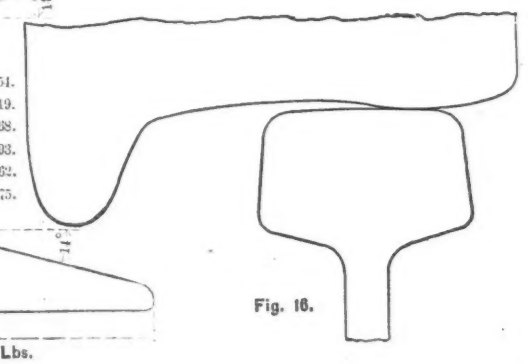


Fig. 16.

1887. DELAWARE, LACKAWANNA & WESTERN RAILROAD, SOUTHERN BOUND TRACK.

Passenger Trains.—	28 drivers ($17{,}000^{\cdot 8} \times 35^2$) =	83,110,000
	364 wheels ($7{,}000^{\cdot 2} \times 35^2$) =	531,270,000
Freight Trains.—	36 drivers ($14{,}000^{\cdot 8} \times 16^2$) =	19,118,180
	580 wheels ($9{,}000^{\cdot 8} \times 16^2$) =	260,053,100
Coal Trains.—	280 drivers ($12{,}500^{\cdot 8} \times 10^2$) =	53,050,000
	3494 wheels ($9{,}000^{\cdot 8} \times 10^2$) =	509,000,000
	Total	1,455,601,230
Tonnages in pounds.—	28 drivers × 17,000 =	476,000
	36 drivers × 14,000 =	504,000
	280 drivers × 12,500 =	3,500,000
	364 wheels × 7,000 =	2,548,000
	4074 wheels × 9,000 =	36,660,000
	Total	43,694,000

Ratio of tonnages (1876 to 1887) $= \frac{43{,}694{,}000}{24{,}218{,}600} = 1.804.$

$\frac{1{,}455{,}601{,}230}{1.804} = 806{,}874{,}296$, which is the sum of product for 1887 corrected to the tonnage basis of 1876. Dividing this by the sum of the

*A paper read before the American Institute of Mining Engineers, February, 1887.

products for 1876, we get $\frac{806,874,296}{584,958,300} = 1.38$, which is the ratio of wear of rail per unit of tonnage under the respective traffic conditions of the years in question. That is to say, the wear of the rails for each gross ton of traffic, is 38 per cent greater under the conditions of 1887 than in 1876.

Our railroads discovered some time since that they must provide more metal in the heads of their rails to be worn away, but it is also plain that they need stiffer sections than have yet been largely adopted, and broader heads for the distribution of pressures.

As a logical sequence to this paper, it is incumbent to present a section designed in accordance with the principles laid down. This is done in Fig. 14 with no idea that it will be adopted bodily by our roads, but with a hope that it will exert a modifying influence upon future rails. The effort will also serve a valuable purpose if it makes clear the fact that, for a rail of given weight, good practice confines the designer within very narrow limits, and thereby emphasizes the folly of multiplying patterns for minute differences, between which no man can authoritatively decide.

(TO BE CONTINUED.)

OFFICIAL STATEMENTS AND REPORTS.

El Callao Mine, Venezuela.

The following extracts from the report of the superintendent upon the working of the property during 1886 will be of interest to our readers:

FINANCIAL RESULTS AND COSTS.

		Tons.
During 1886, there was hoisted from No. 4 shaft and No. 6 shaft a total of		74,399
Add for ore in mills on January 1st., 1886		1,100
Total ore receipts		75,499
Of the above quantity, the old and new mill crushed	75,399	
Ore in store in mills, December 31st., 1886	100	
		75,499

In this report 2000 English pounds of undried ore is one ton. Money values are expressed in francs. An ounce of gold is of English standard fineness = ·916⅔. The "bullion year" began on December 20th, 1885, and ended on December 17th, 1886. The ore and expense accounts are for the 12 calendar months of 1886. The precise value of the gold produced for the last months of the year will not be known until the account-sales are received from London.

The total yield of gold for the "bullion year" was about 181,300 ounces, valued at 17,480,000 francs, coming from 73,708 tons crushed. The yield per ton of ore crushed was about 2·46 ounces, or say 235 francs.

The expenditures during the year were as follows:

	Tons.	Francs.	Francs per ton.
Mine and mine improvements	74,399	4,103,032.26	55·1
Milling and grinding concentrations	75,399	1,357,329.92	18·0
Taxes and expressage on bullion and coin		173,973.76	2·3
Total operating costs		5,634,335·94	75·4
Construction: Enlargement new mill, 20 stamps added		222,744.76	....
Total expenditures at Callao in 1886		5,857,080·70	....

This sum of 5,857,080·70 francs embraces all costs at Callao, of mining, milling, improvements and general expenses; general expenses at the mine are included in mining and milling costs, including the cost of conveyance of bullion and coin between El Callao and Ciudad Bolivar: it does not cover cost of foreign exchange, and office and general expenses in Ciudad Bolivar. During the first six months of the year, we were expending considerable sums on machinery for No. 6 Shaft, the costs per ton were increased by a strike of the miners, and only 100 stamps were working; the costs were then 85·3 francs per ton. For the last six months of the year, the expenses have averaged 68.5 francs per ton.

The report then gives the cost per ton at El Callao for the past seven years, which correspond to the figures published in the ENGINEERING AND MINING JOURNAL of September 4th, 1886.

The cost for the year 1886 shows 75,399 tons crushed at an expense of 75·4 francs per ton for mining, milling, and freights, etc. Mr. Perkins goes on to say:

If we could contine to mine sufficient pay-ore to keep our entire 120 stamps working, I think our expenses per ton might be still further reduced by the more extended use of air drilling machinery. On the other hand, there will be a tendency towards the increase of costs per ton by a reduction in the number of tons worked, by the large cost of exploration drifts which are necessitated by the present condition of the mine, and by the greater expense for the transportation of ore in the mine owing to the flatness of the vein in the lower workings.

The variations in the yield of bar-gold per ton during 1886 were as follows in ounces:

	Tons crushed.*	Yield per ton.		Tons crushed.	Yield per ton.
January	5067	2·8 ounces.	August	7120	2·6 ounces.
February	5605	2·7 "	September	7957	2·3 "
March*	4692	3·6 "	October	7053	2·4 "
April†	3283	4·6 "	November	7641	1·4 "
May	5317	2·6 "	December	7710	1·4 "
June	6303	2·0 "			
July	6160	2·5 "	Total	73,708	Aver. 2·46 "

The high yield per ton in March and April was owing to the quartz crushed in those months having come very largely from the rich pay-shoot, and from the sweeping down of the richer sections of the old workings; in those months, the miners working with hand drills struck work because their daily task had been increased from 30 to 40 inches of hole drilled; they returned towork, after six weeks of idleness, upon the company's terms. During the time of the strike, we had to depend chiefly upon the ore broken by our air drills for the supply of our mills.

In his report, Mr. Perkins makes but slight mention of the serious caving in of the upper portion of the mine last September. According to rumor, this cave was caused during the absence of Mr. Perkins by the adoption of a system of robbing the rich pillars he had left to secure the mine and to form an ore-reserve for future use. The general opinion about this famous mine appears to be, that its enormous "bonanzas" are practically exhausted, and that nothing short of the greatest economy and skill on the part of the engineers in charge will now succeed in extracting enough gold to pay expenses, and make some returns to the stockholders.

* The tons crushed, as stated in this table, are for the "Bullion Months:" therefore they do not agree with the ore statements, which are for the calendar months.

† Months in which the miners did not work.

DIVIDENDS PAID BY MINING COMPANIES DURING APRIL AND FROM JANUARY 1st, 1887.

NAME OF COMPANY.	Paid in April.	Since Jan. 1.	NAME OF COMPANY.	Paid in April.	Since Jan. 1.
Adams, Colo	.....	$15,000	Mary Murphy, Colo	$17,500	$52,500
Aurora, Mich	$40,000	40,000	Mammoth, Utah	10,000	10,000
Atlantic, Mich	.....	40,000	Montana, Limited, Mont.	.....	204,600
Bellevue, Idaho, Idaho	.....	37,500	Mount Pleasant, Cal	.....	45,000
Big Bend Hydraulic, Dak	6,000	24,000	Ontario, Utah	75,000	300,000
Calumet & Hecla, Mich	.....	500,000	Original, Mont	.....	3,000
Central, Mich	.....	40,000	Paradise Valley, Nev	10,000	10,000
Cons. Cal. & Va., Nev	108,000	432,000	Plymouth Cons., Cal	25,000	100,000
Colorado Central, Colo	13,750	27,500	Quicksilver, Cal	.....	53,750
Daly, Utah	75,000	150,000	Quincy, Mich	.....	160,000
Elkhorn, Mont	5,000	20 000	Silver King, Ariz	25,000	100.000
Granite Mountain, Mont	200,000	500.000	Small Hopes, Colo	50,000	200,000
Hecla Cons., Mont	15,000	60,000	St. Joseph's Lead, Mo	.....	30,000
Iron Silver, Colo	.....	100,000	Viola, Limited, Idaho	.....	18,750
Homestake, Dak	25,000	100,000	Yankee Girl, Colo	.....	50,000
Illinois, New Mex	.....	25,000			
Jumbo, Colo	5,000	5,000	Total	735,250	3,473,600
Leadville Cons., Colo	20,000	20,000			

Important Inventions in Fuel.—Our English exchanges comment upon two very remarkable inventions in the field of fuel economy. The first is that of Mr. J. Hargreaves, of Widnes, who claims that he can obtain a power of over 30 horses by a combustion of two gallons of coal tar per hour. Still more may be obtained, he says, but, owing to the engine with which he has carried on experiments extending over five years having been so frequently altered and reconstructed, some of the parts are too weak to be safely trusted with the extra strain needed to give effect to the full development of the power which is actually possible by the use of his system. Other kinds of liquid fuel are stated to be just as applicable as coar tar, but, at the present cost of the latter, 20 horse-power can be obtained at a cost of two cents per hour. This result is said to be obtained by the use of very high temperatures within the working cylinder, while by other arrangements the working surfaces are kept at a lower temperature than in the steam engine. All the heat developed by the combustion of the fuel is intercepted, and made to do work, instead of being allowed to escape up the chimney. The second, equally startling, is reported anonymously from Durham, and proposes to effect a great improvement in the heating of steam boilers; a few hints only being thrown out, as to the nature of the results attainable. The cubic bulk of fuel that will henceforth be required for marine steam engines, it is asserted, will be reduced by 70 per cent, giving a gain to the extent indicated by that proportion to the stowage space for cargo in ocean-going steamships. The time for raising steam will be diminished in all steam boilers, stationary or marine, by at least two-thirds. The cost of fuel consumption will be reduced by more than one-half; and the production of smoke will be absolutely annihilated. The process is stated to have been made the subject of actual experimental demonstration, and every test has been applied. It ought to be added that the new process is said to be applicable to existing steam boilers, and that the working out of that process will very greatly reduce the present wear and tear of boilers, fire-bars, and implements.

PATENTS GRANTED BY THE UNITED STATES PATENT-OFFICE.

The following is a list of the patents relating to mining, metallurgy, and kindred subjects, issued by the United States Patent-Office.

PATENTS GRANTED TUESDAY, MAY 3D, 1887.

362,053. Electric Rock-Drill. Charles E. Ball, Philadelphia, Pa., Assignor to Charles A. Cheever, trustee, New York, N. Y.
362,059. Water-Valve. Gardiner Campbell and George G. Campbell, Milwaukee, Wis.
362,081. Regulating the Supply of Liquid to Retorts or Gas-Generators. William T. Hildrup, Jr., Harrisburg, Pa.
362,089. Rock-Drilling Machine. John Jennings, Canon City, Colo., Assignor to Kittie C. Jennings, same place.
362,102. Brick-Machine. Samuel E. McGregory, St. Louis, Mo.
362,112. Die for Forging Car-Wheels. James Rigby, Minneapolis, Assignor to the Rigby Car Wheel Co., St. Paul, Minn.
362,113. Process of Making Car-Wheels. James Rigby, Minneapolis, Assignor to the Rigby Car-Wheel Co., St Paul, Minn.
362,118. Metallic Roofing. Longley L. Sagendorph, Cincinnati, Ohio, Assignor of one half to Harlan P. Lloyd, same place.
362,130. Machine for Pulling Coke from Ovens. Frederick C. Weir, Cincinnati, Ohio.
362,187. Gas-Engine. Albert Schmid, Allegheny, and J. Charles Beckfield, Reserve, Allegheny County, Pa.
362,191. Apparatus for Separating Oil and Grease from Steam. Sinclair Stuart, Plainfield, N. J.
362,198. Machine for Crushing Ores. Edward M. Bowick, Charleston, S. C.
362,205. Joint for Gas Mains. Edmund C. Converse, Pittsburg, Pa.
362,222. Gas-Stoppage Alarm. Frank J. Mackert and William J. Hague, Allegheny, Pa.
362,233. Process of and Apparatus for Manufacturing Gas. Theodore G. Springer, New York, N. Y., Assignor to the National Gaslight and Fuel Company, Chicago, Ill.
362,234. Gas Machine. Benj. T. Stauber, Moberly, Mo.
362,337. Means for Making Metal Castings. John Walker, Cleveland, Ohio.
362,360. Tool for Dressing Emery Wheels. Albert E. Convers, Taunton, Mass.
362,362. Bagasse Furnace. Frederic Cook, New Orleans, La.
362,363. Amalgamator. Henry Cook, Philadelphia, Pa.
362,366. Rock and Coal Drill. Charles B. Dawson, Angus, Iowa.
362,402. Method of and Apparatus for Testing Acids. Theron C. Stearns, Cedar Rapids, Iowa, Assignor to Ed. R. Shaw, same place.
362,441. Production of Aluminium and Aluminium Bronze. Richard Gratzel, Bremen, Germany, Assignor to the Aluminium and Magnesium Fabrik Patent Gratzel, same place.
362,454. Clod Crusher and Pulverizer. David Lubin, Sacramento, Cal., Assignor of two thirds to Harry Weinstock and Albert Bonnheim, both of same place.
362,467. Apparatus for Generating an Illuminating and Heating Gas. William T. Stewart, Pittsburg, Pa., Assignor of one half to William H. Denniston, same place.

THE METALLURGY OF STEEL.[a]

By Henry M. Howe.

(*Continued from page* 315.)

§ 51. SUDDEN COOLING AFFECTS THE PHYSICAL PROPERTIES OF STEEL BY CAUSING DISSIMILAR RATES OF CONTRACTION.

I. THROUGH CAUSING INTERNAL STRESSES.—Let us consider these stresses and their effects on (A) specific gravity, (B) tensile strength, (C) ductility, and (D) hardness.

A. EFFECT ON SPECIFIC GRAVITY.—Consider a round bar while being quenched. The exterior first cools, contracts, becomes rigid, its dimensions being determined by the size of the still comparatively hot, expanded, mobile interior. The resistance of the interior to the return of the exterior to the dimensions which it had before heating acts on that exterior precisely as a tensile stress does on a body at constant temperature. If very powerful it strains it beyond its elastic limit, it takes a permanent set, it is permanently distended. The stress may exceed the ultimate strength of the outer layers, which then crack, the piece breaks in hardening. The interior continues to contract; its adhesion to the now rigid distended exterior prevents its own complete return to its initial dimensions; it may, in its struggle to reach them, somewhat compress the exterior, but not enough to efface the distention previously caused. The piece, as a whole, remains somewhat enlarged, its specific gravity is lowered.

The final state of external compression and internal tension is readily verified by slitting a hardened steel bar in two, lengthwise, in a planing machine; each half becomes curved, concave on the planed side.[b]

That the low specific gravity of hardened steel, while perhaps in part due to the preservation by sudden cooling of chemical combinations, which are lighter than the composite mass of iron plus the carbide Fe_3C of which annealed steel mainly consists, is largely due to mechanical distention, is further indicated by the experiments of Barus and Strouhal. On progressively removing annular layer after layer from the exterior of a hardened steel bar, 3 cm. in diameter, whose sp. gr. after hardening was 7·7744, the sp. gr. of the residual core increased with surprising regularity, as, by the removal of more and more of the shell it was permitted to contract further and further, until, when its diameter had fallen to 1·38 cm., or a little less than half its initial size, its sp. gr. had risen to 7·8009, or approximately half way towards that which it had before hardening, which had been 7·8337.[c]

After the cooling has progressed slightly and the outside has contracted more than the still comparatively slowly cooling and disproportionally distended interior, it is no longer able to contain it and at the same time to preserve its original shape. It is therefore shortened and bulged,[d] thus slightly approaching the spherical shape, in which the minimum of exterior holds the maximum of interior; and this distortion is not wholly effaced by the subsequent contraction of the interior. I have elsewhere offered, with confirmatory experiments, this explanation of the shortening and the increase in diameter of round bars on sudden cooling.[e]

B. EFFECT ON TENSILE STRENGTH.—Studying the effect of sudden cooling on the tensile strength of a round bar, we may, for our present purpose, consider it as composed of a nest of concentric cylindrical spiral springs, firmly, but not absolutely rigidly attached to each other at many points along their length. If to an annealed bar, which in this view would consist of such a nest of springs initially free from internal stress, we apply a powerful longitudinal tensile stress, grasping as usual the skin of the bar (*i. e.*, the outermost spring), owing to the pliancy of the interstratal connections the outer spring must clearly bear an undue proportion of the stress, and indeed each spring will bear a slightly greater proportion than the one next within it. This will cause the system to break down piecemeal under a stress which would be impotent if uniformly resisted by all the springs. This effect is more readily grasped if we conceive a very thick short bar, *e. g.*, a disk 6 feet in diameter and 6 inches long, subjected to stress parallel with its axis and applied to its circumference.

A suddenly cooled bar in this view consists of such a set of springs, but with the outer ones in initial compression, the inner ones in tension, owing to the residual stress due to contraction at dissimilar rates. Extraneous tensile stress applied by grasping the outer spring (as happens when such a bar is pulled apart in the testing machine), is not resisted by the outer springs until they have elongated by as much as they were initially compressed, the inner springs meanwhile supporting the whole extraneous stress in addition to their initial residual stress. This condition, the opposite of that in the annealed bar, tends to favor the outer springs at the expense of the inner ones. Residual stress, then, if moderate, should increase the tensile strength of the system, by tending to equalize the stress borne by the several springs, through counteracting the effects of interstratal yielding; and when it becomes just intense enough to exactly balance them, the tensile strength should reach its maximum, again declining as with still more sudden cooling the still more powerful residual stress throws an excessive proportion of stress on the inner springs.

C. EFFECT ON DUCTILITY.—While the effect of stress on ductility may not be so readily traced, yet the simile of the springs may at least partially explain it. When extraneous tensile stress is applied to the outermost of such a nest of connected concentric springs initially free from stress, and thus resembling an annealed bar, the outer spring first reaches its elastic limit, undergoes permanent elongation, breaks; the particles which connect it with the next inner spring similarly permanently elongate, then break, then the next spring elongates and breaks, etc. After the outer spring breaks (and it may break at many points in its length), its broken fragments, still transmitting the stress to the intact springs within it, are, owing

[a] Copy-right by the Scientific Publishing Company, 1887.

[b] Use of Steel, Barba, Holley, p. 10. I have verified this experimentally.

The internal distortion and consequent stresses set up in large steel castings by the difference in the rates of cooling and contraction of their different portions (a difference which, thanks to the high melting-point of the metal, and the comparatively low temperature of the mould, may be very great), are sometimes so extreme that the particles of the metal even with the mobility which they acquire at a full red heat may not be able to travel and to flow far enough to completely efface them. A large casting from which much cutting has to be done, even if carefully annealed before the cutting begins, will often spring much out of shape when part of the metal has been cut away, proving the existence even after annealing of internal stresses, whose equilibrium is destroyed by cutting away a portion of the metal which had sustained them. Hence the importance of annealing such pieces after rough machining.

[c] Am. Jour. of Science, XXXI., p. 386; Jour. Iron and St. Inst., 1886, I., p. 372.

[d] Journal Iron and Steel Inst., 1879, II., p. 428, Caron, Barba, op. cit., p. 10.

[e] Trans. Am. Inst. Mining Engineers, XIV., p. 400.

to the elongation which each of these undergoes both before and after its individual rupture, progressively drawn apart more and more up to the instant when the final parting of the last spring occurs, so that part of the elongation of each spring is superadded to that of those outside it, and the system, as a whole, is greatly elongated.

So, too, as the fragments of each broken spring are drawn apart longitudinally, the remaining area of cross-section of the system is simply that of the still unbroken inner springs, and we get great reduction of area.

If, however, as in the case of a bar of hardened steel, the inner springs are under such initial tensile stress that they break simultaneously with the outer ones, we have none of the cumulative action, the superadding of the elongation of one layer to that of the next which occurs with our annealed bar; we get but little elongation, and, since the final area is not diminished by the drawing asunder of successive outer layers, but little reduction of area. Nor, if the initial stresses be so severe that the inner springs break before the outer ones, will the elongation of the system be increased by the addition of the elongation of one spring to that of another, such as arises when the outer spring breaks first, as is clear on reflection. If the tensile stress were applied through the inner spring, then as the fracture gradually extended outward from spring to spring the two fragments of each broken spring would continue to transmit the tensile stress to the spring next outside them, and, being always under tensile stress, they might be continually drawn farther and farther apart, and the final fracture might be deeply cup-shaped. But as the stress is transmitted along the outer spring, there is nothing to draw apart the fragments of the successively broken inner ones; their elongation is not superadded to that of the outer one, and the total elongation of the piece is simply that of the outer spring, which breaks last.

A simile pushed too far always misleads. This one may, I hope, portray certain features of what occurs during rupture, not, of course, with complete accuracy, yet closely enough to facilitate our present study. Dissatisfied with it, I offer it for lack of a better.

D. EFFECT ON HARDNESS.—The state of violent compression in which the exterior of a quenched bar is left may be expected to force its particles more closely together, and thus to partially account for the hardness of the external layers. The powerful compression which steel undergoes in cold-forging does actually harden its exterior.

To test this I had one portion of an unhardened steel bar of $\frac{13}{16}$" diameter reduced to $\frac{3}{4}$" diameter when cold, by a single draught through a die (Billings cold-drawing process). A portion of the same bar which had not been thus treated, was accurately turned to the same diameter. The hardness of the cold-drawn portion, as measured by indentation, was very perceptibly greater than that of the turned portion. I doubt whether the difference could be detected by the file.

II. DISSIMILAR RATES OF CONTRACTION PRODUCE A KNEADING EFFECT.—The different rates at which the concentric layers of a steel bar contract during sudden cooling, owing to their different rates of cooling, must occasion more or less insterstratal motion, rubbing together, interlacing, pressure, tension; and since we find that such internal motion, whether as in kneading dough, putty or clay, arising chiefly from compression; or, as in forging metals, from both compression and tension;[a] or as in pulling molasses candy, chiefly from tension, appears to increase the intermolecular cohesion, to raise both tensile strength and toughness, we may reasonably ascribe to this feature of sudden cooling a strengthening and toughening effect. And if by more thorough interlacing it increases the intermolecular cohesion, the resistance to displacement, we may suppose that this increases the hardness as measured by indentation.

§ 52. SUDDEN COOLING PREVENTS COARSE CRYSTALLIZATION.—At a high temperature steel and especially phosphoric steel appears to gradually assume a coarse crystalline structure, which naturally diminishes both its tensile strength and ductility. Forging and sudden cooling not only prevent coarse crystallization, but even after it has been acquired apparently efface it, at least in part. Hence the injury which steel so often receives on long exposure to an excessively high temperature, especially if it be not subsequently forged; even for annealing the heating must neither be too strong nor too long, lest the loss of ductility due to crystallization be greater than the gain due to the relief of stress. In some phosphoric irons the tendency to coarse crystallization is so strong that they are actually tougher after sudden then after slow cooling. (See §§ 45 and 126.)

In sudden cooling interstral movements must arise, since neighboring layers must cool and contract at very different rates, and forging must cause similar interstratal movements. These, like the agitation of any solidifying crystallizing mass, should not only prevent the formation of large crystals with extended surfaces of weak cohesion, but even break them up when once formed. To this action during sudden cooling, and probably also to the preservation of a compound of iron with hardening carbon which is naturally fine-grained, and which would be broken up by slow cooling, the fine grain of hardened steel may be largely due.

§ 53. EFFECTS OF TEMPERING AND ANNEALING.—Let us now consider how the effects of sudden cooling which have just been discussed are removed or weakened by tempering and annealing, and how the latter operation removes the effects of cold-working.

1. CHEMICAL ACTION.—As explained in §§ 23 and 50, the heating which occurs in tempering and annealing relaxes chemical inertia so as to permit the carbon to pass from the hardening state, in which it has been previously imprisoned by sudden cooling, to the cement state, to a degree which, within limits, increases with the temperature reached; hence, the higher this heating the softer the steel becomes.

2. REMOVAL OF THE EFFECTS OF CONTRACTION AT DISSIMILAR RATES.—We have seen that contraction at dissimilar rates, owing to sudden cooling, should produce two quite distinct mechanical effects, (A) internal stresses, (B) a kneading or forcing together of the particles of the metal. There is both reason to expect that cold-forging, punching, etc., should, and evidence that they do, produce both these effects, though not in the same relative proportion. Cold-working in moderation, as in cold-rolling and wire-drawing, increases the tensile strength very greatly while lowering the ductility. In excess, as in

[a] That forging acts very largely by tension is suggested by the fact that cold-forging makes iron lighter and not denser. Langley found that repeated cold-hammering lowered the specific gravity of a steel bar from 7·828 to 7·817 and then to 7·780. ("The Treatment of Steel," p. 42.) So, too, in a case reported by Percy (Journ. Iron and St. Inst., 1886, I., p. 63.), cold-drawing appears to have lowered the specific gravity of wire from 7·8402 to 7·8142.

punching and shearing, it lowers both tensile strength and ductility, sometimes wholly destroying the latter. As shown in § 51, these are the results which should be expected from the stresses which sudden cooling should set up, which from the nature of the case should closely resemble those of cold forging, which must leave the exterior in a state of compression and the interior in one of tension.

A. REMOVAL OF INTERNAL STRESS.—The action of tempering and annealing in removing internal stress can, I think, be most readily grasped by regarding the metal not as an ideal solid, but merely as an extremely viscous liquid, approaching the condition of lead or of molasses candy. A remembrance of the readiness with which cold steel flows under the action of car wheels, of the punch, etc., may help us to grasp this idea. If the particles of the metal be subjected, even when cold, to sufficient stress, they may yield to it and flow, and thus diminish the stress. Just as in the case of molasses candy, this flow may continue until the stress is so far relieved that it just fails to produce any further flow, when the particles gradually come to rest in equilibrium under the maximum stress which, with their existing viscosity, they can sustain without flow; or, if the stress and the flow which it induces exceed a certain amount, the viscosity of the metal exceeds its cohesion, and, unable to flow farther, it breaks. Evidently, the more we heat either candy or steel the less viscous does it become, the more readily does it yield to stress, whether external, as that of hammering, etc., or internal, as that induced by previous sudden cooling or cold-forging. If hardened or cold-forged steel be heated to a red or yellow heat (say 900° to 1100° C.) its viscosity is so much diminished, its particles become so mobile that they flow under the stress which they had defied when cold, and almost completely relieve and efface it. If we would avoid setting up new stresses in place of those which we have dispelled we must allow our steel to cool so slowly that its different portions will contract practically uniformly: our steel becomes annealed: but it is clear that the true annealing, the relief of stress, was effected by the heating, and that the slow cooling is merely to avoid undoing the annealing already accomplished.

If the hardened or cold-worked steel be heated, not to a red but merely to a straw-heat (say 230° C.), its particles are rendered mobile, but far less so than by the much higher heating employed for annealing: if heated a little higher than a straw-heat, say to blueness (290° C.), they become still somewhat more mobile. This increased mobility relieves previously induced stresses, and the brittleness which they had caused is thus removed to a greater or less degree as the temperature reached be higher or lower: the steel is tempered. The temperature to which steel is heated for tempering, though it suffices to relieve the more intense stresses, is so low, and hence the contraction which occurs when the tempered steel is again cooled is so slight, that, even if the steel be suddenly cooled no serious stresses are likely to arise.[a] Hence rapid cooling is usually employed for convenience.

As heating hardened steel softens and toughens it by transferring carbon to the cement state, it may appear superfluous to call in the relief of stress simultaneously effected to help explain annealing, but in § 54 cogent reasons are given for believing that both the chemical effect of sudden cooling and its physical effect in causing stress give strength and brittleness. And the same reasoning indicates that both the chemical and physical effects of reheating contribute powerfully to its weakening and toughening effect.

B. REMOVAL OF THE EFFECT OF THE KNEADING ACTION.—As shown in § 54, the effect of the kneading action due to dissimilar rates of contraction is probably not wholly, if at all, removed by subsequent annealing.

3. REMOVAL OF THE EFFECT OF HARDENING ON CRYSTALLIZATION.—See § 52.

4. THE TEMPERATURE AT WHICH ANNEALING BEGINS.—Annealing appears to begin at surprisingly low temperatures. The gradual deterioration of cutlery even at temperatures below 100° C is referred to in § 25. So, too, the thermo-electric power,[b] which appears to increase so constantly as stress diminishes that it has been regarded as an index of stress (indeed, they may stand in the causal relation), increases even when steel is exposed to a temperature no higher than 66° C., though very gradually. During three hours of exposure to this temperature the rise of the thermo-electric power continues at an almost constant rate. At 100° C. it rises more rapidly, rising as much in ten minutes at this temperature as it increases in three hours at 66°. At 185° C. the rise is still more abrupt, and at 330° it rises so abruptly as to seem to jump instantly to its maximum. At each temperature there is a maximum, or normal thermo-electric power, and hence, probably, a maximum degree to which stress is relieved, which during continued exposure to that temperature are approached asymptotically. The higher the temperature the higher is the normal (maximum) thermo-electric power, the lower is the corresponding normal state of stress which is thus approached, and the more rapidly are they approached, *i. e.*, the faster and more fully is stress effaced.

The stresses due to sudden cooling appear (as already explained) to lower the density. Langley found that the density of steel, slightly lowered by quenching from 100° C., was restored by re-exposure to 100° with subsequent slow cooling.[a]

Similar changes occur in other metals at low temperatures; thus Matthiessen and Barus and Strouhal[c] found that the conductivity of hard-drawn silver and German silver was changed, from which it is inferred that the stress due to hard-drawing was diminished, by continued boiling in water.

It is not certain how far the changes effected at these low temperatures are due to relief of stress and how far to the escape of part of the carbon from the hardening to the cement state.

Abel's results show that at a straw heat the condition of carbon changes quite rapidly. But the changes which occur at 100° C. we naturally ascribe to the relief of stress, because it is easy to understand how stress should be relieved at this low temperature, especially since we find similar changes occurring at 100° in silver and in German silver, while a change in the condition of carbon at such low temperatures would certainly be more unexpected.

(TO BE CONTINUED.)

NOTE.—The publishers of the ENGINEERING AND MINING JOURNAL will thank the readers of this article if they will promptly call attention to any inaccuracies they may observe in it.

[a] That slight stress may arise even in quenching from 100° C. is indicated by an experiment of Langley's. (The Treatment of Steel, p. 42.) A cold-hammered steel bar was heated to 100° C. and slowly cooled; its sp. gr. then was 7·816. When again heated to 100 and quenched in cold water its sp. gr. fell to 7·790, but it rose again to 7·817 on again heating to 100, and cooling slowly. Other trials gave closely similar results.

[b] Barus and Strouhal: Bulletin of the U. S. Geological Survey, No. 14, pp. 54–55.

[c] *Idem*, pp. 93–4.

PERSONALS.

Professor John A. Church has gone to China on professional business.

Mr. L. D. Ricketts, of Leadville, has been appointed geologist for Wyoming Territory, with headquarters at Cheyenne.

Professor A. D. Churchill has gone to Hailey, Idaho, to complete his examination of the Crœsus gold mine on behalf of an English capitalist. He is, at the same time, to make other examinations in the same neighborhood.

FURNACE, MILL, AND FACTORY.

The M. C. Bullock Manufacturing Company has removed from 158 Lake street to 138 Jackson street, Chicago, Ill.

A charter has been granted to the Auburn Bolt and Nut Works, of Auburn, Schuylkill County, Pa., capital $30,000.

The Clinch Valley Coal and Iron Company has been organized at Tazewell, Va., with a capital of $10,000,000.

The Murray Iron-Works, Burlington, Ia., were burned on the 1st inst. Virtually all the patterns, castings and machinery were damaged beyond repair.

The Nitro-Glycerine Power Engine Company has been organized at Chicago, Ill., with a capital stock of $500,000 for the manufacture of engines to be run by nitro-glycerine; incorporators, G. F. Lanaghan, A. F. Herrilly and C. C. Poole.

The Calumet Iron and Steel Company, of Chicago, Ill., has started up their splice-bar mill, a new acquisition to their already extensive plant at Cummings. The new mill is running full-time, and is rolling out splice-bars at the rate of about 50 tons a day.

Park, Bro. & Co., Limited, proprietors of the Black Diamond Steel-Works, Pittsburg, Pa., have entered suit against the Chartiers Valley Gas Company, of Pittsburg, to recover $210,000 damages, basing their claim on the ground that they have suffered losses to the extent of the sum named in consequence of an insufficient supply of natural gas.

The failure of the Maiden Creek Iron Company, which operates a large rolling-mill at Blandon, Pa., is announced. Hiram Kaufman has been appointed receiver to wind up the company's affairs. Assets, $95,000; liabilities, $65,000. The creditors are principally New York and Philadelphia parties. The mill continues in operation.

All but one of the big shops of the Chicago Forge, and Bolt Company, Chicago, Ill., were destroyed by fire on the 2d inst. The manufactory was the second largest of its kind in the country. It is in the item of machinery that the greatest loss occurs. The buildings were entirely consumed and the heat was so great as to almost completely ruin every piece of machinery belonging to the company except those in the forge shop. Until recently the establishment was known as the American Bridge-Works.

The Frisbee-Lucop Mill Company has completed its new "Frisbee" mill for the wet crushing of quartz and other ores. It is constructed after novel and improved designs, invented by Gideon Frisbee, and is intended to do the work of the stamp-mill in a effective and economical manner. The machine can be seen in operation and tested on Wednesday afternoon, May 11th, and thereafter, at W. Ames & Co.'s spike-works, Washington and Morgan streets, Jersey City.

On the night of the 3d inst., nine men were wounded some of them fatally and others more or less severely by an explosion at the North Chicago Rolling Mills, Chicago, Ill. The accident was occasioned by dumping a car of molten metal into one of the huge molds in the rail mill. Enough water chanced to be in the receptacle to cause an explosion. The molds flew into a thousand pieces, and the liquid metal scattered about for rods. A score of men were working within range, but a bare majority escaped.

CONTRACTING NOTES.

Contracts open will be found on page xix. New contracts this week: No. 316, Centrifugal Pump, Engine, and Boiler, complete; No. 317, Sandstone Pier; No. 318, Bridges; No. 319, Iron and Stone Work; No. 320, Pumping Engine; No. 321, Boiler; No. 322, Sewers; No. 323, Complete System of Water-Works; No. 324, Drilling a Well; No. 325, Boilers and Engines; No. 326, Dredging.

A second-hand boiler from 30 to 40 horse-power is wanted by Messrs. Boyd & Baxter, Atlanta, Ga.

Only two bids for excavating additional shaft No. 13½, on section seven, of the new aqueduct, have been received. They were Knapp & Eggleston, $19,375; O'Brien & Clark, $21,315.

J. D. Joyner, Franklinton, N. C., is in the market for a 50 horse-power engine and 50 horse-power return tubular boiler; also a good planer and matcher, a resawing machine, and a band saw of moderate capacity.

The town of Hinton, W. Va., has decided to build water-works, and voted the money for that purpose. Communications from contractors, etc., are wanted; further particulars can be learned from J. Prince, of Hinton.

Messrs. R. P. McCormick & Co., of Kansas City, Mo., contractors for the double track railroad tunnel, of Kansas City, Mo., 1000 feet long, have contracted with the Ingersoll Rock Drill Company of this city for a complete plant of tunneling machinery, comprising one "straight line" air compressor; one air receiver; seven Ingersoll tunneling drills, with columns, mountings, boilers, etc.

Bids for 350,000 tons of coal for use during the present year for cannel coal to be used in the manufacture of gas, in Philadelphia, Pa., were the following New York firms: Perkins & Co., 10,000 tons of Breckenridge cannel coal, at $10.45 a ton, and 6500 tons of Boghead cannel coal, at $7.65 a ton; James & William Wood, 6000 tons of Hooptown cannel coal, at $9.20 a ton.

The directors for public institutions at Boston, Mass. received the following bids for furnishing coal: C. A Campbell & Co.—Anthracite coal, from $4.33 to $5.28, according to terms and places of delivery; Cumberland coal, $3.75; gas coal, $4.25 at Deer Island, $5 at the House of Correction. Edmund Keyes—Anthracite coal, $4.60 to $5.65, according to terms and places of delivery. H. G. Jordan & Co.—Cumberland coal, $3.78. F. H. Odiorne & Co.—Gas coal, $4.15 not discharged, $4.40 discharged. J. A. Heaton—Cumberland coal, $3.77.

LABOR AND WAGES.

Miners' wages at the Hibernia mines, near Rockaway, N. J., have been raised from $1.25 to $150 per day.

The wage scale adopted at the Miners' Inter-State Convention, held at Columbus, Ohio, in February, went into effect on the 2d inst. The new scale advances the wages of 13,000 railroad miners in the Pittsburg, Pa., district five cents a ton.

The movement among the Schuylkill County, Pa., miners for an advance of from 10 to 20 per cent in wages promises to extend throughout the anthracite region. A formal demand was made on the 2d inst., for an increase of 10 per cent at several collieries.

At a joint meeting of the coke-workers of the Miners' Amalgamated Association and Knights of Labor at Everson, Pa., on the 3d, inst., it was decided to immediately suspend work until the demands for an advance of twelve and a half per cent were granted. Work stopped on the 4th inst., and not one of the 12,000 ovens in the Connellsville region is in operation. The struggle promises to be protracted and very bitter. Every thing is quiet, however, and no trouble is anticipated unless an attempt is made to fill the places of the men with imported labor.

GENERAL MINING NEWS.

TENNESSEE COAL, IRON AND RAILROAD COMPANY.—Official advices to us state that the product for April was 89,065 tons of coal, 31,200 tons of coke, and 11,061 tons of pig-iron.

ALABAMA.

ALABAMA AND TENNESSEE COAL AND IRON COMPANY.—At a meeting held at Sheffield on the 26th ult., the charter granted the company by the State of Alabama, which is a very liberal one, was accepted, and the business headquarters formally established at Sheffield. Mr. A. S. Colyar resigned the presidency of the company, and Col. E. W. Cole was elected in his place. Judge Henry B. Tompkins was elected vice-president and general counsel. This company is now constructing three large blast-furnaces at Sheffield, of about 150 tons capacity each per day, and owns upward of 70,000 acres of bituminous coal lands in the Black Warrior coal-fields of Alabama, situated about sixty miles south of Sheffield, through which the Sheffield & Birmingham Railroad already runs. The mines will at once be opened, and the construction of coke-ovens completed in time to supply their furnaces with coke when ready to put in blast, which are under contract to be finished in thirteen, fifteen and seventeen months from February 8th, 1887.

ALABAMA GOLD MINING COMPANY.—This company has been organized at Birmingham, where the principal office will be, with a capital stock of $1,000,000. The company owns over 400 acres of land, across which runs a forty-foot vein of gold ore, over a mile in length. This vein has been examined by Prof. West, of Birmingham, from whose report these facts are stated. The ore procured from the mine by Prof. West himself, and assayed by Alfred F. Brainerd, of that city, shows an average of over $200 gold per ton of ore. The officers of the company are Dr. Chas. M. Erwin, of Birmingham, president, and James B. Merrill and Robt. E. Merrill, of Edwardsville, vice-president and secretary, respectively.

ARIZONA.

YAVAPAI COUNTY.

ST. LOUIS & YAVAPAI.—It is announced that the company propose to borrow money to add ten stamps to the mill. This addition would more than double the output, and the company could, it is stated work more economically by borrowing the money and paying it back from the results than by waiting to earn it with the small mill now operating.

BRITISH COLUMBIA.

VICTORIA COAL COMPANY.—A dispatch from Nanaimo, on the eastern shore of Vancouver Island, says an explosion occurred in No. 1 shaft of the company's mine, on the 3d inst. One hundred and fifty men are believed to have been in the mine at the time. At midnight several bodies had been recovered and a few persons seriously burned were rescued at the same time. These numbered twelve in all. There were little hopes of recovering alive any of these still in the mine. A rescuing party went down, but owing to black-damp was unable to do any thing. When the dispatch left Nanaimo the mine was on fire. Dispatches on the 5th state that strenuous efforts are being made to subdue the flames. There is but little hope of rescuing the entombed miners. Five miners and seven Chinamen were brought up dead. Fears are entertained of a second explosion of gas. A dense volume of steam arises from the air shaft, and until the fire is completely subdued it will be impossible to enter the workings. Fresh relays of working parties are being brought from Wellington, and ships in the harbor have also supplied about sixty men who are working nobly. The cause of the explosion is as yet unknown. It is supposed to have been caused by the explosion of coal-dust, similar to that which occurred in the Queen Pacific Mine. The first intimation those on the surface had of the explosion was a terrific shock, followed by an outburst of thick black smoke through the air-shaft. The first explosion was quickly followed by a second one stronger than the first. It carried pieces of wood, miners' lamps, etc., hundreds of feet in the air. In a few minutes flames began to issue through the air-shaft with a loud roaring noise. The fan-house soon caught fire, and was quickly consumed.

CALIFORNIA.

AMADOR COUNTY.

HARDENBURGH.—This, or the Casco mine, at Middle Bar, has been sold to San Francisco parties. It has been idle for many years.

PLYMOUTH CONSOLIDATED.—The statement just issued for the first quarter of 1887 shows that the product was $182,330.70; the operating expenses for the same period, $66,962.59, giving a profit of $115,368.11. The surplus, April 1st, was $121,448. The cost of the forty stamps now being added to the Pacific mill will be paid out of the above surplus—about forty thousand dollars. The new stamps will be ready to operate in May, when the company will have one hundred and sixty stamps at work. The Pacific shaft has been sunk the required depth, and a drift for No. 7 will be commenced this month. Both mills are still at work on the upper levels. No stoping has been done on the bottom.

CANADA.

PROVINCE OF QUEBEC.

ALBERT.—Official advices to us state that these mines at Capelton, now owned and worked by Messrs. G. H. Nichols & Co., of New York, instead of being worked out as recently reported, are in better condition than they have been for several years past. The developments at the bottom of their slope have resulted in opening up enormous bodies, richer sulphides, richer in copper than ever before worked. The reopening of the old No. 1 shaft has also developed large reserves of high-grade ore. Messrs. Nichols & Co. are now having built at these mines one of the most complete hoisting, crushing and concentrating plants ever erected in Canada, as already mentioned in a previous issue. Messrs. Copeland & Bacon are the contractors for this work. On its completion, early next summer, the output from these mines will be very greatly increased.

COLORADO.

The Denver, Texas & Forth Worth Railroad Company has been organized at Denver, with a capital stock of $30,000,000; shares, $100 each, with a view to the completion of the Denver, Texas & Gulf road from Pueblo through to a connection with the Fort Worth & Denver City Railroad Company and the operation of a through line from Denver to the Gulf of Mexico. The general offices of the company shall be in Denver. The officers are as follows: President, Sidney Dillon; Vice-President, John Evans; Secretary, Charles Wheeler; Assistant Secretary and Treasurer, John T. Granger. The main line will be from Denver, by way of Pueblo, thence through the counties of Pueblo and Huerfano to a point in Las Animas County on the Colorado line; thence through the counties of Colfax, Mora, and San Miguel to the Texas line; thence to a connection with the Fort Worth & Denver City Railroad, and thence to Fort Worth, and thence to the Gulf of Mexico. The branches will be known as the Bessemer Branch, beginning at Bessemer andextending to Silver Cliff and Rosita. Together with a branch to be known as the Huerfano Branch, beginning at a point on the main line in Huerfano County and extending to Walsenburg and Huerfano Park. Together with a branch to be known as the Trinidad Branch, beginning at a point on the main line in Las Animas County, and running to a point in that county on the boundary line between Colorado and New Mexico, near where such line crosses Long's Creek. Together with a branch to be known as the Coal Branch, beginning at the main line in Las Animas County, near its crossing of Frijole Creek, and running to the coal fields on Frijole Creek.

NAVAJO OIL AND IMPROVEMENT COMPANY.—This company has been organized, with a capital stock of $250,000. The operations of the company will be conducted in Archuleta and Conejos counties, the principal business office being at Alamosa. The directors are John L. McNeil, William S. Jackson, Adair Wilson, Herbert J. Ross, Malcolm B. Frank and Benjamin F. Klee.

It has been known for a long time that oil existed along the Valley of the Navajo, and for several months past it has been taken out in small quantities.

CHAFFEE COUNTY.

CORNUCOPIA.—The company, of Buena Vista, are litigating with the Hartsfeld Smelting Company over the recent unsuccessful result of a plant sold, conditionally, by the latter. We referred to the working of this smelter in our issues of February 26th and April 2d.

CLEAR CREEK COUNTY.

Mr. G. W. Hall, superintendent of the Colorado Central Consolidated Mining Company, intends to begin work shortly running a tunnel through Leavenworth Mountain to Georgetown, cutting well-known properties in its lateral course, and possibly projected to the Colorado Central mine, 4500 feet away, which vein it will cut 500 feet below the Ocean Wave tunnel level, or 250 feet below the deepest workings of the mine, passing 2000 feet below the apex of the mountain. The size of the tunnel is 8 by 7½ feet, and it is to be supplied with double track. As soon as the tunnel reaches bed rock the heavy plant of machinery will be in place and the work will be prosecuted with Sergeant power drills and three shifts of men per day This tunnel will cut the veins on the north slope of Leavenworth, hitherto almost inaccessible because of the deep slide.

LAKE COUNTY.

We take the following from the Leadville *Herald-Democrat:*

IRON SILVER.—The concentrator will probably start on the 15th inst. The lease now working south of the south incline was discontinued on the 1st inst., and the ground will be worked by the company hereafter. The winze in the McKeon shaft is down over 200 feet, getting some water, which is easily handled by the appliances for the purpose.

MORNING STAR.—Operations at the McHarg shaft have been resumed, and it is now raising its full complement of a heavy lead ore, running from 60 to 70 per cent in lead and 10 to 20 ounces in silver. An incline from the shaft is following the ore shoot to the southeast.

ROBERT E. LEE.—The Roudebush lease is taking out iron that runs 50 per cent and more excess, and from 10 to 12 ounces in silver.

THESPIAN.—The mine will probably be put in active operation in about one month. It has a shaft 596 feet in depth, which was abandoned several years ago. Governor Tabor purchased a five-eighths interest, with the intention of vigorously pushing its development. It is situated near the Blind Tom and Satellite claims, and, as the water has nearly disappeared from the old shaft, has probably been drained by the flow in the latter claim.

OURAY COUNTY.

BLACK GIRL.—This group of mines, consisting of eleven claims, located at Camp Paquin, four miles south of Ouray, were sol to a Boston capitalist, it is stated, for $100,000. Work will at once be pushed at the mines.

SILVERTON.—Work on the tunnel on the lower level is being pushed as rapidly as possible, and more than enough ore is being taken out by the company to pay the cost of development.

PITKIN COUNTY.

DURANT VS. EMMA.—In the United States Court at Denver before Judge Hallet, in the case of Hyman vs. Wheeler et al. (Durant vs. Emma mine, Aspen), leave was given complainant on the 28th ult., to extend a drift in a southerly direction from the Durant incline, starting about 100 feet from the bottom, and to connect with the Visino incline extended, and to run a drift in a southerly direction from the south drift of the Durant incline, to connect with the Visino incline, and to extend an uprise up and into the Durant sideline. Leave was granted defendants to inspect the work. The complainants to deposit proceeds in the registry of the court, and to make their report to the court.

J. C. JOHNSON VS. ARKANSAS.—About a year ago the J. C. Johnson Consolidated Mining Company was enjoined, in Judge Hallett's court, by the Arkansas Mining Company from running their incline into the Arkansas ground. It has since transpired that the J. C. Johnson manager, about six months ago, obtained a receiver's receipt to about three fourths of the Arkansas, the most valuable part of this ground, unknown to the Arkansas owners. On the 30th ult., the manager of the Johnson mine served a notice upon the attorneys of the Arkansas Company, that he would, next week, ask Judge Hallett to dissolve the injunction.

DAKOTA.

LAWRENCE COUNTY.

AMERICAN TIN.—A number of the many claims owned by the company will be explored to a depth of from 200 to 300 feet, beginning with the Cleveland, shaft which is down about 150 feet.

BUXTON.—The company will resume shipments as soon as work at the mines is fairly under way.

GALENA SMELTER COMPANY.—This company organized at Deadwood, will erect a smelter at Galena.

RETRIEVER.—Regular shipments to Omaha are about to begin again. The mine is improving as developments progress.

GEORGIA.

POLK COUNTY.

The copper mines at Rockmart are now being opened up again by Wm. Tudor and Frederick Heart. They have bought up the lands around the mines, and it as stated that they will put up a furnace.

IDAHO.

ALTURAS COUNTY.

IDAHOAN.—The company has resumed its regular shipments of ore to Hailey. It has large reserves in the mine and on the dumps.

SHOSHONE COUNTY.

Mr. S. G. Reed, of Portland, Oregon, has purchased the Sullivan and Bunker Hill mines at Wardner, it is stated, for $600,000, and will proceed at once to develop the mines. He has also purchased the reduction works of the Helena Concentrating Company at the same place for $126,000.

INDIANA

GRANT COUNTY.

Press dispatches announce that the well at Fairmount, near Muncie, to which we referred in our last issue, by a test of Prof. Orton, State Geologist of Ohio, hows that it is flowing nearly twelve million feet per day.

MARION COUNTY.

The well that has been drilled at Brightwood, a suburb about four miles northeast of Indianapolis, reached a depth of 1300 feet without showing gas or oil. On the 29th ult., it was shot by a charge of 300 pounds of dynamite, and in a few minutes a flow of gas resulted. The pressure is light, the flame rising only about eight feet above the mouth of the well, but it is regarded as indicative that gas may possibly be found quite near the city in sufficient quantities.

VERMILLION COUNTY.

At Clinton, sixteen miles north of Terre Haute, while boring for coal, natural gas was struck at a depth of 145 feet.

WABASH COUNTY.

The city of Wabash has appropriated $3000 for gas explorations, and it is believed that it will be found in the immediate vicinity. Well No. 2 will be put down at once.

At Lafontaine, the gas-well is down 250 feet, and there is no track of rock. It is believed that the Trenton will be the first lime-stone encountered.

KANSAS.

FRANKLIN COUNTY.

OTTAWA GAS PROSPECTING COMPANY.—At a depth of 560 feet this company struck a strong pressure of gas at Ottawa last week, equal in force to that found at a much greater depth at Ossawatomie. It is the intention to sink the well 2000 feet if necessary.

MEXICO.

BADIRAGUATO GOLD MINING AND MILLING COMPANY.—At the meeting, held at St. Louis last week, referred to in our last issue, reports were made by W. H. Lee, President; B. B. Graham, ex-President, and the directors, showing the condition of the company. The stockholders present agreed to pay into the treasury the amount asked by the directors, viz: $12,000. It was agreed that 24,000 shares of stock be issued to the stockholders at the rate of 50c. per share. The property is to be thoroughly examined before any steps looking toward its abandonment are entertained. Mr. Chambers, of St. Louis, one of the largest stockholders, has gone to the mines to look into the matter.

CUSIHURIACHIC.—The company is again in difficulties and a meeting is to be held on the 13th inst., to take steps for the voluntary dissolution of the corporation. Some months since, as mentioned in our issue of December 11th, 1886, the shareholders were asked to subscribe 15 cents per share and take up the floating debt of the company, receiving notes for subscription. They failed to respond, and the company is left with a bonded debt of $600,000 due in December, 1889, and about $150,000 floating debt. The burden is too heavy, and a reorganization must come. There is said to be no intention of freezing out the shareholders. It is probable that a committee of shareholders will be sent to the mine.

LEANDRANIA.—It is reported that an English company is negotiating for the purchase of this gold mine of Sonora.

MULATOS.—An English syndicate is about to purchase this mine, as their offer of £660,000, it is stated, has been accepted. A disputed title has blocked the proceedings. The mines are now in full operation, and only require additional stamps to deal with the ore, and these it is proposed to erect from time to time. The mine was discovered in 1806 and has been worked continously ever since, yielding large returns.

SINDA.—This company, of Michoacan, has opened its new reduction works, which contain machinery for treating both gold and silver. The outlook at this property is reported to be good.

ST. LOUIS SONORA.—At a meeting of stockholder, held in St. Louis this week, the directors were authorized to close the sale of the property, for which an English syndicate has been negotiating for some time. The reports from Mexico, that the property under the mining code of that country has been forfeited to the government, is denied by the officers of the company,

who say that before their time expired for doing work they applied for an extension and secured it, and that they have on file in their office in St. Louis papers duly signed and attested by the proper Mexican officials by which they are not compelled to do any more work until October 1st next.

MICHIGAN.

COPPER MINES.

FULTON MINING COMPANY.—F. E. Gay, of New York, President of the Atlantic Mining Company, has bought in the Fulton Mining Company's property for $20,000. He has been paying the taxes on the property for many years, and bid it in to make his title good. The company owned 3000 acres of the so-called mineral lands. It was originally called the Forsyth mine, and was opened in 1847, says the Marquette *Mining Journal*. In 1853, the Fulton Mining Company commenced working the old location on the southeast quarter of section 33, and opened four shafts with an adit 18 feet wide. Between shaft 3 and 4 several tons of copper was found in small masses, and the vein yielded considerable silver. They shipped in 1853, 1255 pounds of refined copper. The Kearsarge Conglomerate and Amygdaloid both cross the northwestern portion of the property.

MILWAUKEE & LAKE SUPERIOR COPPER LAND COMPANY.—The company just organized owns valuable copper and timber lands in 49–46 and 49–45, Ontonagon County, east of the Nonesuch copper mine. The capital is $24,000 ; shares, $1 each.

IRON MINES.

CLEVELAND.—The company is making preparations for the sinking of a shaft on the north shore of Lake Angeline to reach the body of hematite recently found by the diamond drill under the lake, as mentioned in our issue of March 26th. The shaft will be sunk to the ledge, after which it will follow the natural incline of the formation, foot, to the ore.

LUDINGTON.—The Marquette Ore Company has just been granted a judgment amounting to about $9000 against this company of the Menominee range for breach of contract. It had agreed to sell certain dump piles to the ore company, and refused to live up to the terms of agreement, for the reason, it is said, that the dump proved far richer in ore than they supposed.

MITCHELL.—Percy R. Pyne, of New York, on behalf of the syndicate who recently purchased this property, has begun suit against Samuel Mitchell in the U. S. District Court, New York, to recover $175,000 already paid for the Mitchell mine, at Negaunee, the sale of which was reported in our issue of April 9th. The parties claim that the ore is too high in phosphorus. It was sold for $225,000, and the sale was made through Ames & Avery, of Milwaukee, who it is reported got a commission of about $60,000. Mitchell claims that the company's agent and chemist made a thorough examination of the ore before buying the property.

NONPAREIL.—Ore hoisting has commenced. Test pits being sunk on the property at points removed from the main workings give promise of finding ore.

MONTANA.

DEER LODGE COUNTY.

GRANITE BELLE.—This mine, situated near the Granite Mountain, has been sold to St. Louis parties, for about $50,000. Mr. Reuben A. Richard negotiated the sale. Work will be commenced immediately, and contracts for hoisting machinery and a pump have been made, on condition that the success of the prospect work is sufficient to justify the purchase of additional machinery. The mine has already been developed to a considerable extent.

GRANITE MOUNTAIN.—It is stated that the company is now considering the erection of additional 100 stamp-mill.

MADISON COUNTY.

NOBLE MINING COMPANY.—This company has been organized, with a capital stock of $2,000,000 shares ; $10 each, to carry on operations at Smith Fork of Wisconsin Creek, near Sheridan. The office will be at St. Louis.

NEVADA.

ESMERALDA COUNTY.

AURORA HILL.—The case of H. Blasdel vs. H. Tangerman, for possession of the Aurora Hill mine, located near Aurora, has been decided in favor of the plaintiff. The General Land Office is now proceeding regularly to test the question why Blasdel's entry of the mining ground in Aurora shall not be canceled. Should such cancellation follow the Land Office hearing, which was to take place on April 26th, it is thought the judgment of the Circuit Court will be reversed.

STOREY COUNTY—COMSTOCK LODE.

We condense the following from the Virginia City *Chronicle* :

BELCHER.—A temporary draft of forty miners has been made at this mine pending alterations at the Santiago mill. The concentrators will be taken out and the old process of amalgamating the pulp in bulk as it flows from the pans will be substituted. This course was decided upon on account of the concentrators failing to operate successfully on the ore lately extracted.

CONSOLIDATED CALIFORNIA & VIRGINIA.—Official reports, dated April 23d, show that on the 1400 level from the main south drift, which is about 200 feet south from the Con. Virginia shaft, a west drift was started, and after being run to a point 30 feet west from the old workings it cut into ore of fine quality which already shows a width of 12 feet, and the face still continues in ore as the cross-cut is advanced to the west. This ore is without doubt the upward extension of the development made last January in winze No. 1, then being sunk below the 1400, and which is now being stoped out.

During the week, 1022 tons of ore were shipped to the Morgan mill and 1720 tons to the Eureka mill. The average assay value of all the ore worked at both the above mills during the week, according to battery samples, was $32.34.

JUSTICE.—Arrangements have been consummated for milling some of the ore exposed above the 350 level.

OPHIR.—The official report of the situation in Ophir mentions that fair-grade ore is showing in the bottom of north winze No. 1 at a depth of 15 feet below the track floor of the north drift on the 1300 level. This winze is located about 60 feet north of the Con. Cal. & Va. line.

POTOSI.—The mill to be erected southeast of the Chollar shaft will contain 40 stamps. The work of construction has begun.

SAVAGE.—Ore is showing in the rise being driven upward to connect with the 500 level. The south drift on the 800 is skirting along the vein of a solid belt of mineralized quartz. There is some improvement in the grade of quartz entered by the east and west cross-cuts from the north lateral drift on the 1200 level.

YELLOW JACKET.—The average daily ore output has been increased to 200 tons since the Vivian mill has been secured in addition to the Brunswick. Explorations will be extended westward on the upper levels to explore the northern extension of the ore development made on the 230 in Crown Point.

PENNSYLVANIA.

COAL.

LEHIGH & WILKES-BARRE COAL COMPANY.—No. 10 breaker of this company at Sugar Notch was burned on the morning of the 2d inst. The coal in the mine then caught fire, and the flames extended down the shaft to a depth of 700 feet. Loss, $60,000. Preparations are being made to flood the mines, as this is the only way to extinguish the fire. This will take a week or more, and will entail great expense. The breaker was built in 1879, and had a capacity of 1200 tons per day. It had not been in operation for some time.

NATURAL GAS.

BADEN GAS COMPANY.—The company has issued $200,000 of first mortgage 6 per cent bonds, about half of which have been taken by stockholders, while the remainder are offered for sale. Purchasers of the bonds have the option of exchanging them for stock, dollar for dollar, at par.

CHARTIERS VALLEY GAS COMPANY.—At a meeting to be held June 30th, it is proposed to increase the capital stock by another million to $4,000,000. This money is to be expended in extending the company's plant and increasing its business and profits. The company is said to be free from debt and already has an income sufficient to pay running expenses and a 10 per cent dividend on the increased capital. The stock has been removed from the list at the New York Stock Exchange because the company has not established a transfer office.

COLUMBIA NATURAL GAS COMPANY.—At the annual meeting held at Franklin, on the 4th inst., the Philadelphia directors secured entire control. James. E. Salter, of Philadelphia, was elected President in place of Mr. Patterson, of Franklin ; J. W. Mackey succeeds C. A. Gilfillan as Vice-President ; B. W. Breden was elected Treasurer, and James Miller, Secretary. There is now no conflict in the management, and as the company has a good plant they will show a large increase in receipts next month over last. The report that the company is controlled by the Standard Oil Company is denied.

PHILADELPHIA.—At the second annual meeting held in Pittsburg, this week, George Westinghouse, Jr., was re-elected President. The financial statement shows the total indebtedness of the company to be $1,617,504.33, and the total assets $615,100.02, leaving $1,002,404.31, against which there is a treasury stock of $1,163,850. The operating expenses for the year were $542,175.99 and the earnings $957,984.79. The total number of connections made by the company, with mills and dwellings, in Pittsburg last year were 7000, while this year they were 12,400. The company has just struck a large gas well in St. Clair township at a depth of 2100 feet. One thousand acres of surrounding territory has since been quietly leased by the company. The well is considered to be one of the largest yet struck in Allegheny County.

OIL.

Exports of refined, crude, and naphtha from the following ports, from January 1st to April 30th :

	1887. Gallons.	1886. Gallons.
From Boston	1,698,710	1,596,123
Philadelphia	38,688,645	39,040,154
Baltimore	1,895,689	3 920,976
Perth Amboy	4.730,342	1,096,444
New York	108,586,219	120,513,169
Total exports	155,599,605	166,166,866

TENNESSEE.

EDES MIXTER & HEALD ZINC COMPANY.—Concentrating-works are to be put up at the company's zinc mines, using a large plant of crushers, rollers, jigs, etc.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, May 6th.

Statistics.

Production of Coke on line of Pennsylvania RR. for week ended April 30th, and year from January 1st : Tons of 2000 pounds.

	1887. Week.	1887. Year.	1886. Week.	1886. Year.
Tyrone & Clearfield	...	1,735	.....	.....
Allegnany Region.	4,766	83,137	6,930	69,345
West Penn. RR.	1,193	37,846	1,969	32,706
Southwest Penn. RR	68,526	1,138,137	52,383	701,846
Penn. & W. Region	6.250	117.079	6,414	107,585
Monongahela	3,877	57,478	2,837	37,556
Pittsburg Region.	.....	...	.....	.....
Snow-Shoe	1,100	17,734	. ..	9,211
Total	85,712	1,453,146	70,533	958,250

Production Anthracite Coal for week ended April 30th, and year from January 1st :

TONS OF 2240 LBS.	1887. Week.	1887. Year.	1886. Week.	1886. Year.
P. & Read. RR. Co.	168,480	2,404,276	115,995	3,178,135
Cent. R. R. of N. J.	119,775	1,492,965	*	*
L. V. RR. Co.	162,163	2,287,646	77,197	2,007,259
D., L. & W. RR. Co.	66,557	1,679,227	68,801	1,731,338
D. & H. Canal Co.	53,888	1,272,793	59,518	1,303,344
Penna. RR.	59,405	987,200	51,018	1,036,870
Penna. Coal Co.	27,394	436,140	22,623	395,283
Total	657,662	10,559,247	393,052	9,652,229
Increase	261,610	907,018	....	.....
Decrease	.....	.....	....	.....

* Included in tonnage of Philadelphia & Reading R. R.

The above table does not include the amount of coal consumed and sold at the mines, which is about six per cent of the whole production.

Production for corresponding period :

1882	8,058,218	1884	8,610,380
1883	9,174,165	1885	7,822,587

Production Bituminous Coal for week ended April 30th, and year from January 1st : Tons of 2000 pounds, unless otherwise designated.

EASTERN AND NORTHERN SHIPMENTS.

	1887. Week.	1887. Year.	1886. Week.	1886. Year.
Phila. & Erie RR.	.....	.....	3,342	7,370
**Cumberland, Md.*	61,936	862,458	903	374.960
Barclay, Pa.	4,115	77,550	3,789	68,238
**Broad Top, Pa.*				
H. & Broad Top RR.	3,853	137,870	9,890	121,587
East Broad Top	.....	.....	.....	.....
Clearfield Region, Pa.				
Snow Shoe	4,000	61,630	.....	34.770
Karthaus (Keating)	2,206	66,668	2,000	43,826
Tyrone & Clearfield	65,259	1,045,409	17,436	591,588
Alleghany Region, Pa.				
Gallitzin & Mountain	19,966	294,831	25,441	262,589
Pocahontas Flat Top Coal.				
Norf'k & West. RR.	23,686	383,656	17,471	265,584
Kanawha Region. W. Va.				
Ches. & Ohio RR.	†30,000	474,759	†25,000	388,901
Total	215,021	3,404,831	105,272	2,159,414

* Tons of 2240 lbs. † Estimated.

WESTERN SHIPMENTS.

Pittsburg Region, Pa.				
West Penn RR.....	6,649	109,244	8,877	98,534
SouthwestPenn.RR.	2,407	55,344	8,327	66,635
Pennsylvania RR...	6,713	81,652	5,431	69,105
Westmoreland Region, Pa.				
Pennsylvania RR...	33,175	526,429	7,640	346,479
Monongahela Region, Pa.				
Pennsylvania RR...	7,719	116.977	10,675	98,928
Total.....	56,663	889,646	40,950	679,681
Grand total.....	271,684	4,294,477	146,222	2,839,095

Anthracite.

During the past few days, many buyers have accepted the advice which we gave a week ago, and have been buying coal. The demand is quite active, and prices are inclined to strengthen where they have been weak. The cause for this activity is largely, if not entirely, due to cautious buyers providiug against a possible strike. In our last number we stated that the situation was grave. At the present time, although it is impossible to speak with any certainty as to what will be the final outcome of the demand on the part of the miners for an advance in wages, we think that the outlook is alarming.

The following is a copy of the notice sent by the miners to all the coal companies as well as the individual operators :

MAHANOY CITY, Pa., April 19, 1887.

SIR : In pursuance of joint action of Miners and Laborers' Amalgamated Association and Knights of Labor of the anthracite coal regions, we hereby demand that you advance all wages and contract prices in and around your collieries at the rate of 10 per cent on and from the second day of May, 1887. An answer should be made on or before the 9th day of May, 1887, to

M. F. KANE, Shamokin, Pa.,
DANIEL DUFFY, St. Clair, Pa.,
H. MCGARVEY, Beaver Meadow, Pa.,
Secretaries and Committee.

The companies say that they employ neither the men who sign the demand, nor the organization which they claim to represent, and in most, if not all, cases, they refuse to recognize the document. Some go so far as to say that they will not grant an advance in wages under any circumstances. It looks to us as though this attitude of the companies must result in a strike at some, if not all, of the mines. It is intimated that if the miners strike the coal handlers will instantly refuse to load the coal on hand at the shipping ports. This would be very embarrassing to those dealers and consumers who have been running with bare yards, hoping to break down prices by keeping back their orders as much as possible.

With or without a strike, it is not a bad thing to have on hand a moderate amount of coal. There are no indications that prices will be much, if any, lower than at present. The companies were never working in greater apparent harmony than now. The estimated requirements of the market for this month is 2,500,000 tons. The actual output, however, will be just what the market will take. The big companies are standing firmly by prices and are letting the production take care of itself. As the railroad companies are not urging shippers to unload cars and force it upon the market, the cars are becoming full of coal at the shipping ports, and there are not facilities to bring to market a large production. The simplicity of this safety valve, and the successful manner in which it works as a regulator of the trade, is a surprise and gratification to most of the gentlemen who have been devising plans for the regulation of the trade for many years past.

The strike of the coke workers in the Connellsville region, because of their dissatisfaction with the award of arbitration, weakens the cause of the workingmen. It also brings capital and labor back to the barbarious position of settling disputes by the rule of survival of the fittest.

We quote ordinary free burning coal, net, per ton, f.o.b vessels, as follows :

Lump.....	$3.40
Steamboat.....	3.40
Broken.....	3.40
Egg.....	3.60
Stove.....	3.90
Chestnut.....	3.70
Pea.....	3.15
Buckwheat	2.15
Dust.....	1.75

The small coals are very scarce and their prices have a rising tendency, although it is stated that they are already so high as to permit bituminous to take the trade in the East. Lehigh Stove coal has been selling as low as $3.75 per ton.

The New York, Susquehanna & Western Railroad has moved its offices to comfortable quarters in the Smith Building, 15 Cortlandt street.

A Boston dispatch under date of May 3d says :

"At a meeting of the Board of Commissioners of the Vessel Owners and Captains' National Association, held here to-day, the minimum rates on coal from New York and neighboring ports to various Eastern ports were established as follows : From Rondout, New York, Weehawken, and Port Johnson to New Haven and Bridgeport, Rhode Island ports, and New Bedford, 65 cents ; from Elizabethport, Perth Amboy, and South Amboy to the same ports, 70 cents ; from Rondout to Boston and Portland, below bridges, $1 ; to Portsmouth, $1.10 ; and to Newburyport, $1.15 ; from New York, Weehawken, Hoboken and Port Johnson to Boston and Portland, 80 cents ; to Portsmouth, 90 cents ; and to Newburyport, 95 cents ; from Elizabethport, Perth Amboy, and South Amboy to Boston and Portland, 85 cents ; to Portsmouth, 95 cents ; to Newburyport, $1.

The rates from all other ports will remain as before established. A mutual freight traffic agreement was entered into to-day between the Vessel Owners and Captains' National Association and the barge lines carrying coal to points east of Cape Cod.

Bituminous.

The business in this class of coal is looking better than for years past. Contracts aggregating a liberal quantity have been closed since our last. Spot coal is moving in a small way at full prices, which are easily obtainable. Cars are in good supply. At Baltimore vessels are not abundant. At Philadelphia there is an ordinary supply at minimum rates. Most shippers are looking on with much interest at the pending contest between the anthracite producers and the miners. If a strike occurs, the bituminous producers, who recently gave their miners a 10 per cent advance, expect a harvest.

Buffalo. May 5.

[From our Special Correspondent.]

On Tuesday last the Coal Exchange met and fixed the prices of anthracite coal until further notice as follows :

SIZES.	2240 lbs. f o.b. vessels, Buffalo.	To dealers on cars at Buffalo. 2240 lbs.	To dealers on cars at bridges for Western shipments. 2240 lbs.	Retail, 2000 lbs., delivered, Buffalo, screened, etc.
Grate.....	$4.30	$4.30	$4.00	$4.60
Egg	4 40	4.40	4.10	4 70
Stove.	4.75	4.75	4.45	5.00
Chestnut ..	4.75	4.75	4 45	5.00
Pea.... ..	....	.....	....	4.25

A year since, prices were quoted as follows :

Grate.....	$4.30	$4.00	$4.00	$4.25
Egg..	4.30	4 00	4.00	4.25
Stove.....	4.55	4.25	4.25	4.50
Chestnut ..	4.55	4.25	4.25	4.50

The advance this year can be readily seen without taking up your space by specially alluding thereto.

It is too early to comment upon the results of this advance. A large dealer assured me that the arrangement was a foregone conclusion arrived at long before the Inter-State Commerce bill went into effect. Although there is no combination, there is a tacit understanding among producers, carriers, and dealers which is tantamount thereto this season.

Our local newspapers have commenced remarking upon the advance. The *Courier* writes : "The dealers say this is entirely due to the Inter-State Commerce bill, and that under that law it actually costs them 50 cents a ton more to bring coal from the mines to Buffalo. They claim that they are not making a cent more than at the old figures."

The same paper describes another new phase of the trade this season : It was also decided that customers could not have their coal held over from month to month, as has formerly been the rule. This means that those who buy their year's fuel at one time, when it is supposed to be cheapest, must have all of it delivered at the same time. It also means that the retail dealers will not, as heretofore, take a small deposit on say eight or ten tons of coal, and then receive pay for it in installments when delivered, and at the price originally contracted for, though the market might in the meantime have taken a decided upward tendency. The coal must be all bought and delivered at once. The dealers say they have lost money in carrying so many customers over, and in self-defense must stop it."

The public are informed that the prices announced are not likely to be changed. The Erie, Champlain, Oswego, and Cayuga, and Seneca canals will be open for navigation next Saturday, the 7th, and the Black River Canal on the 12th. Light boats are already moving. The Welland Canal (Canada) opened May 4th for vessels drawing 12 feet; on the 26th there will be 14 feet of water in the channel.

Vessels have arrived here from Chicago. The latest news is that navigation is open at Duluth and that the Sault Ste. Marie is navigable, although considerable ice is met with, hindering the progress of boats.

In consequence of the immense fleet of vessels which arrived here and the scarcity of coal, Lake freights have declined. Nevertheless, few owners took the reduced rates, preferring to leave light. The closing rates were 60c. to Chicago, Milwaukee, Manitowoc, and Duluth, 25c. to Toledo, and 70c. to Racine, and 75c. to Kenosha.

The barge O'Neil, laden with 800 tons of coal, for Toledo foundered in a storm last Saturday; crew saved. The first disaster of the season.

The shipments of coal by lake from April 28th to May 4th, both days inclusive, 53,500 net tons, namely, 30,420 to Chicago, 1600 to Manitowoc, 12,180 to Milwaukee, 1950 to Racine, 2600 to Duluth, 450 to Kenosha, and 4300 to Toledo. Total thus far this season, 141,000 net tons.

Boston. May 5.

[From our Special Correspondent.]

Rather more trade is to be reported from the anthracite branch of the Boston market. This has been brought about chiefly by the reduction in freight rates, which has, by the way, been the most important happening of late. New York rates have been reduced 20 cents per ton, from 85@95c. to 65@75c. As noted below, the barge business did it. The Philadelphia rate is made proportionately low by the action of the Philadelphia & Reading people in reducing steamer freights 20 cents. Of course such a movement as this must be felt at all the ports.

There is no real activity here even now, but some signs of life begin to appear. The companies maintain old f. o. b. prices, at least nominally, but outsiders are cutting rates, as they have been doing of late. Nothing new regarding stocks of coal is reported, save that a little better supply of the smaller sizes, as nut and pea, is noticeable. The supply of these sizes is still light, however.

In soft coal the leading point of interest is the possibility of an advance in the f. o. b. price. The indications are that prices will certainly be maintained, but trade is slow, and manufacturers seem disposed to give the pool a strong test. The bulk of business here is still in cargo lots at $2.60, f.o.b., and quite an amount of coal is being moved in that way.

It has been intimated that the delivered price of $4.15 below bridges for gas coal has not been strictly lived up to, but no cutting is noticeable. There is a fair amount of business in this branch.

Our forecast of a harder year for vessel owners seems to be meeting with proof, and from the very reason anticipated, viz., from competition of barges. The barges have been running to Boston from New York at 80@90c., including discharging, whereas vessels asked 85@95c., exclusive of discharging, which costs about 25 cents. The reduction of vessel rates is to head off barge competition, but the move does not appear to be a promising one. The probabilities are that the Vessel Owners' Association have seen their palmiest days, as far as the dictating of minimum rates is concerned.

We quote, exclusive of discharging : New York, 85 @95c. ; Philadelphia, $1.05. ; Baltimore, $1.15 ; Newport News and Norfolk, $1.05@$1.10.

Quite naturally retail prices are not very strong, but trade is quiet. We quote delivered prices as follows : White Ash Stove, $6@$6.25 ; Egg, $5.75@$6 ; Broken, $5.50@$5.75 ; Lorberry, $7 ; Franklin, $7.50 @$7.75.

Wharf prices are as follows : Broken, $4@$4.25 ; Egg, $4.50@$4.75 ; Stove, $4.75@$5.

Pittsburg. May 5.

[From our Special Correspondent.]

Coal.—The market during the week has presented nothing very new or important. Prices have been maintained and a fair business transacted. April has always been noted for heavy shipments by water. Present one no exception. Amount shipped April, 557,300 gross tons ; in bushels, 16,719,000. Price of coal at the tipples: First pool, 100 bushels, $4.50; second pool, $4.25 ; third pool, $3.62½; and fourth pool, $3.

Railroad rates, $5@$5.50 per 100 bushels.

Connelsville Coke.—It is not too soon to form any idea of what effect the strike will have on the prices of coke. Present rates are: Blast-Furnace, $2 f.o.b. at oven; Foundry, $2.30; Crushed, $2.60. Freights westward and northward are: to Pittsburg, 88c. a ton; Shenango and Mahoning valleys and Wheeling, $1.65; Cleveland, $2.50; Chicago, $3.30; and East St. Louis, $3.85.

FREIGHTS.

The latest actual charters to May 6th, per ton of 2240 pounds:

To	From Philadelphia.	From Baltimore.	From New York shipping ports.
Bangor	.....	1.25	.....
Bath, Me	.....	1.25	.65*
Boston, Mass	1.05*	1.15	.65*
Bridgeport, Conn	.....	1.00	.55
Bristol	.....	1.15@1.20	.....
Brooklyn	.....	1.00	.....
Cambridge, Mass	1.05*	.....	.....
Cambridgeport	.....	.....	.....
Charleston, S. C.	.75@.80	.80	.....
Charlestown	.....	.....	.65*
Chelsea	1.05*	.....	.75*
Com. Pt., Mass	1.05*	.....	.65*
E. Boston	.....	.....	.65*
East Cambridge	1.05*	.....	.....
Fall River	.90*	1.00	.70
Galveston	.....	3.60@3.75	.....
Georgetown, D. C.	.70@.85	.....	.....
Gloucester	1.05*	.....	.....
Lynn	1.15@1.25*	.....	.....
Newark	.....	1.00	.....
New Bedford	.90*	1.00	.....
Newberne	.85@.90	.....	.....
Newburyport	1.15*	1.30	.80*
New Haven	.....	1.00	.55
New London	.....	1.00	.....
Newport	.....	.....	.75
New York	.....	1.00	.....
Norfolk, Va	.50	.....	.....
Norwich	.....	.....	.....
Norwalk, Conn	.....	.....	.55
Portland, Me	.....	1.15	.....
Portsmouth, Va	50	.....	.....
Portsmouth, N.H.	1.15	1.25	.75*
Providence, R. I.	.90*	1.00	.75
Quincy Port	.....	.....	.65*
Richmond, Va	.60	.....	.....
Salem, Mass	1.05@1.15*	.....	.65*
Savannah	.90	1.00	.....
Somerset	.....	.....	.....
Wareham	.....	1.25	.....
Washington	.....	.....	.....
Weymouth	.....	1.15@1.20	.....
Williamsb'g, N.Y.	.....	1.00	.....
Wilmington, N. C.	.90@1.00	.....	.....

* And discharging. † And discharging and towing. 3c. per bridge extra. § Alongside. ‖ And towing up and down. ¶ And towing. †† Pilotage. ** Below bridge. *** Old B. L.

MARKETS.

NEW YORK, Friday Evening, May 6.

Prices of Silver per ounce troy.

Apl. May	Sterling exchange	Lond'n Pence.	N. Y. Cents	May	Sterling exchange	Lond'n Pence.	N. Y. Cents
30	4.87½	43¾	95	4	4.87½	43⅝	94⅞
2	4.87½	43⅝	94¾	5	4.87½	43⅝	94⅞
3	4.87½	43½	94⅝	6	4.87½	43½	94⅝

Market has been steady, but closes a little lower, owing to weakness of Eastern Exchanges.

Foreign Bank Statements.—The governors of the Bank of England, at their weekly meeting, made no change in the rate of discount and it remains at 2 per cent. During the week, the bank lost £575,000 bullion, and the proportion of reserve to its liabilities was reduced from 50·90 to 48·28 per cent, against 39⅞ per cent at the same time last year. The weekly statement of the Bank of France shows gains of 1,550,000 francs gold, and 4,500,000 francs silver.

Copper.—The market closes firmer to-day, with Lake Copper at 10c. for spot, and futures from 10·05 @10·20c.; other brands, 9⅛@9¼c.

A large amount of copper has changed hands this week as a result of last week's Lake sale, both buyers and sellers having been waiting for that event.

Considerable copper is going abroad, both as metal and in the form of matte. Anaconda matte being exported at the rate of 1000 tons per month. This latter matte is being piled up in Balfour, Williamson & Co.'s hands, with little effort being made to close the gap between Mr. Haggin's figure and the bid of the Associated Smelters.

Chili Bars closed to-day at £39 5s.

Exports during the week were as follows: To Hamburg, 970 bags copper matte, 99,940 lbs., $5200; to Liverpool, 3315 bags copper matte, Anaconda, 368,190 lbs., $18,425; to Havre, 90 casks copper, Calumet & Hecla, 115,200 lbs., $12,000; to Havre, one cask ingot copper, Orford, 1250 lbs., $125; to Havre, nine plates copper, Orford, 1775 lbs., $178; to Havre, nine bars copper, Orford, 1211 lbs., $121.

Tin.—The market has been very dull, with advancing prices in sympathy with London quotations, which advanced during the week from £102 12s. 6d. to £103 5s. for spot, and £103 5s. to £104 for three months. The Metal Exchange quotations to-day are: 22·95c. for prompt delivery, and 22·85@22·70c. for June and September.

Lead.—This metal has taken an upward start, and sales have been made of nearly 500 tons Common at 4·30c., 4·35c., and 4⅜c., Spot, May and June, and at the close 4·40c. is asked for Common and 4·45c. for Corroding, with the bids 4·35c. and 4·40c. respectively. The advance has been caused mainly by the withdrawal of sellers from the market, since the demand continues to be extremely light and the tone of buyers rather devoid of animation.

Messrs. Everett & Post, of Chicago, telegraph to-day as follows: The market remains about the same, if any thing, a shade firmer. There is a somewhat better feeling, due to growing inquiry. There has been considerable more inquiry for both hard and soft lead, in consequence of which sellers have been asking a little more, but only a moderate amount of business has been transacted. Sales for the past week will probably foot up to 400 tons, at 4·10@4·12½c. Market closes very firm, 4·15c. asked.

Spelter.—There is a little scarcity of domestic brands, but hardly more demand. We quote here 4·50@4·60c., according to brand, for Domestic, and 4¾@4·85c. for Foreign. London quotes Silesian at £14 5s.

Sheet Zinc remains at 6¼@6¾c.

Zinc Oxide is quoted 4@4½c., according to quality, for Domestic; 5⅝c. for Antwerp; and 7⅛c. for Paris green seal in barrels.

Antimony.—We quote Hallett's at 7½@7¾c., and Cookson's 9c. Hallett's is higher in London.

Quicksilver.—There is no change to report. We quote $42 per flask, and 52½@53c. per pound; in London, £7 per flask.

Nickel.—We quote 65c. per pound.

Aluminium—Is quoted at 90c.@$1 an ounce.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, May 6.

The general dullness continues, and there has been a further weakening of prices in most articles. There is very little actual business to report, and in these circumstances quotations are for the most part nominal, and must be taken to represent either the average between buyers' and sellers' views, or the extremes of those views. In the instance of foundry pig-irons, in which all the actual new business is in driblets, quotations represent what the makers would charge if they had the iron to sell, or what consumers would pay if they wished to buy, and must not be taken as a fair criterion of what the prices would be if there were actual sales in quantity.

Should the strike of the stove molders continue long, it is not unlikely that there will be a further temporary easiness in the nominal quotations of foundry irons. On the other hand, the increasing demand for cast-iron pipes, on which quotations have advanced $2 per ton, the foundries being full of work, may advance the price of forge irons.

Scotch irons are practically unchanged, both here and in Glasgow. Importations continue very light. We recently called attention to the fact that some of the Southern and Ohio irons of open texture are gradually replacing the Scotch brands.

The Inter-State Commerce law has now been in operation a month. Thus far it has been a decided block to new business, chiefly on account of the uncertainty of the final adjustment of freight rates; but in many instances the great increase in rates has actually ruled certain goods out of some markets. Whether the wisdom and discretion of the Commissioners will yet avail to solve all the hard problems already presented, as well as those of the future, is still an open question, with the probabilities in favor of a solution in the negative.

The Standard quotations are as follows:

American Pig-Iron.—No. 1 X, $21@$21.50; No. 2 X, $20@$20.50; Forge, $18@$19.

Scotch Pig-Iron.—Coltness, $22.25@$22.50; Dalmellington, $20.50; Clyde, $20.50; Summerlee, $21.75@$22.00; Eglinton, $20.

By cable to the Metal Exchange to-day: Scotch Warrants, 41s. 2d.; Coltness, 54s. 3d.; Langloan, 50s. 6d.; Summerlee, 52s.; Gartsherrie, 48s. 3d.; Glengarnock, 47s. 9d.; Dalmellington, 45s.; Eglinton, 43s.

Bessemer Pig.—Foreign, $20@$20.50; Domestic, $20.

Spiegeleisen.—Foreign 20 per cent, $27@$27.50.

Steel Blooms.—$29@$29.50.

Steel Billets.—$30@$31.

Steel Nail Slabs.—$31@$31.50.

Steel Wire Rods.—$41.25@$41.50 for shipment.

Steel Rails.—Heavy sections, nominally $38@$40 at mill. Light sections, $41@$44 at mill. Foreign Rails are quoted $40.50 at New Orleans.

Structural Iron and Steel.—At mill: Bridge Plate 2·3@2·4c.; Angles, 2·3@2·4c.; Tees, 2·7@2·8c.; Steel Angles, 2·6@2·75c. From dock, Beams and Channels, 3·3c., base.

Steel Plates.—On wharf: Tank and Ship, 2·85@3c.; Boiler Shell, 3¼@3½c.; Boiler Flange, 3½@3¾c.; Boiler Fire-Box, 4@4½c.

Merchant Steel.—American Tool Steel, 7½@10c.; special grades 10@20c.; Crucible Machinery Steel, 4½@6c.; Bessemer Machinery and Spring, 2·7@3c.; Sleigh Shoe Steel, 2·4c.; Bessemer Cutlery, 3·2c.

Plate Iron.—Common Tank, 2·4@2·5c.; Refined, 2·5@2·6c.; Boiler Shell, 2·7@2·8c.; Boiler Flange, 3·7@3·8c.; Extra Flange, 4¼@4½c.

Bar Iron.—For Refined, 2·1@2·2c., base at wharf; Common, 1·9@2c., base at wharf.

Cast-Iron Pipe.—$34@$40, according to size.

Rail Fastenings.—Spikes, 2·55@2·65c., delivered; Angle Fish-Bars, 2@2·2c.; Bolts and Square Nuts, 3·1@3·2c.; Bolts and Hexagonal Nuts, 3·3@3·4c.

Scrap Iron.—Foreign, ex ship, at $20@$21; Choice No. 1, ex yard, at $23.

Old Rails.—Tees, $21.50@$22; Double-Heads, at $22@$22.50.

Nails—$2.10@$2.25 in carload lots

Philadelphia. May 5.

[From our Special Correspondent.]

The month of May promises to be in favor of consumers. The market in general is still strong, because of the fact that earlier in the season so much material was ordered for forward requirements. In a good many cases, this material has not been altogether delivered, and, therefore, consumers who are still receiving stocks from furnaces and mills are able to remain out of the market. Brokers who have been canvassing for business report this state of facts, and say that the only way they can do business with those customers who still have material to be delivered is to sell at concessions, which they can not afford to grant. They are unwilling to do this, and do not believe the market will compel such reductions. The unwillingness to buy is simply due to a desire to let the market weaken as much as possible. Makers of iron do not believe that low prices will continue; in fact, some of the very best local authorities say that an early summer improvement is sure to come. The only difference this week in pig-iron is that furnace companies and agents and brokers are meeting with fresh and business-like inquiry. Forge iron is what is now wanted. Some of our leading brokers yesterday and to-day have had inquiry for 1000 ton lots of forge, but they can not make sales because of a difference of about 50 cents. Buyers argue that the market is working in their favor. Sellers show that stocks in consumers hands and at furnace banks are very light. The outcome of these difference, will be, that buyers will purchase 1 to 300 ton lots of the particular brands they want, but their advisers are warning them of the danger of being left through the probably heavy purchases of some of the larger consumers, who may take a notion to come in and buy for summer and fall. Iron of ordinary and outside brands is decidedly weaker, and this may lead to the placing of a great deal of summer business. The adjustment of freight rates would certainly help along to this end. The furnace capacity is increasing, and there is really no room for the concessions asked for, on account of the price of coal, coke, and labor. There is nothing new to-day from the mining region, and the trade does not apprehend any suspension. Muck Bars are rather quiet at $33. The mills are running short of work, and this means that prices will weaken to the lowest point at which bars can be turned out. The brokers of foreign material have had very few inquiries, and are simply keeping their customers advised as to the ups and downs of foreign markets. The receipts on old orders are liberal, and brokers say a resumption of dealings abroad will take place, as soon as stocks are a little lower. Foreign quotations, while nominally unchanged, are a little more in favor of buyers. The bar-iron makers here and throughout the State report no improvement in manufactured iron, and repeat the usual quotations. Buyers are working along with supplies on hand, and are in no hurry to purchase more than they want from week to week. The nail makers are pursuing a wise restriction policy, which prevents such an accumulation as might lead to a cutting of rates, which are low

enough already. The building requirements in the city, and throughout this State and New Jersey, are taking more nails, but altogether in a retail way. Sheet iron manufacturers report about the same demand as for two or three weeks past, without any features worth noticing. Plate iron makers have booked no orders of consequence, yet no complaints are made, and no capacity has been thrown off, so far as heard. Structural iron manufacturers have a steady run of business, which is paying them well, and the bridge builders are urgent for prompt deliveries. There is no doubt but that the summer's work will be about as heavy as the business of the last sixty days. Prices are strong. Steel rails are going in small lots for early fall delivery at $39 to $40, and old rails are not selling on account of the low prices offered, which is leading to a slight accumulation of stocks. Scrap iron is weak and dull for all kinds, and a drop is probable on account of the heavier receipts from near-by localities.

Pittsburg. May 5.

[From our Special Correspondent.]

The iron market remains in a very unsettled condition, the feeling being feverish and uncertain, and in some cases gives evidence of weakness; this was the situation at the opening of the week. Yesterday a general strike was inaugurated in the Connellsville region; fully 12,000 workers have refused to accept the decision of the umpire; how long this condition of affairs will continue will be for the future to decide. The Executive Committee of the coke syndicate held a conference, at the conclusion of which the members stated that they had concluded to let the movement take its course. They declare that there is a large stock of coke on hand, and that a stoppage, for a while at least, will help trade. The cooler heads among the labor leaders do not favor a strike. The *Labor Tribune* has this to say: "As the matter now stands, there is no argument to be made. There is no question at his juncture which can overslaugh the one chief point, which point is: The good faith due the decision of the umpire. The safety of the arbitration system in the coke regions and the honor of the workmen demand that the decision shall be maintained faithfully." The iron men generally say that a continuation of the coke strike would make pig-iron firm, and cause an advance in the near future. The present weakening tendency in prices is a very hopeful sign for big business. The present condition is not likely to continue very long. Large consumers are taking advantage of circumstances to let prices weaken. They are running the usual risk of driving up prices on themselves by putting off purchasing, and all coming to market about the same time. The fact of the matter is, that for certain grades there is no regular market at present, so that prices are purely a matter of arrangement between buyer and seller, without much regard to what are called market rates. The sales and quotations in this report contain about all the facts that could be obtainable.

	$	$
Coke or bituminous:		
Foundry No 1	21.00@21.50	
Foundry No. 2	20.00@20.50	
Gray F., No. 3	19.00@19.25	
" " No. 4	18.00@18.50	
White	18.00@18.50	
Mottled	18.00@18.50	
Silvery	19.00@19.50	
Bessemer	21.75@22.00	
Charcoal:		
Foundry No. 1	24.00@25.00	
Foundry No. 2	23.00@24.00	
Cold-Blast	26.00@30.00	
Warm-Blast	24.00@25.00	
20 p. c. Spiegel	@31.00	
Muck-Bar		33.00@33.25
Steel Blooms		33.00@33.50
Steel Slabs		33.00@34.00
Steel Crop Ends		23.50@24.00
St'l Bl'm Ends		23.00@23.50
Old Iron Rails		25.00@25.50
Old Steel Rails		24.00@25.00
No. 1 W. Scrap		25.00@26.00
No. 2 W. Scrap		23.00@24.00
Steel Rails		41.00@41.50
" light sect's.		40.00@45.00
Bar Iron		2.00@.....
Nails $2.25 net car lots.		
Steel Nails $2.25 net car lots.		

SALES SINCE OUR LAST REPORT.

Coke and Coal Smelted Lake Ore.

500 Tons	Bessemer	22.00 cash.
500 Tons	Gray Forge	19.00 cash.
500 Tons	Gray Forge	19.25 cash.
100 Tons	No. 1 Mill	19.00 cash.
100 Tons	No. 1 Foundry, all ore	21.75 4 mo.
50 Tons	No. 2 Foundry, all ore	21.25 cash.
50 Tons	No. 2 Foundry	21.00 cash.

Coke—Native Ore.

60 Tons	White Iron	18.50 4 mo.

Charcoal.

30 Tons	No. 2 Foundry	24.75 4 mo.
20 Tons	Cold Blast	30.00 4 mo.

Steel Billets.

500 Tons	American	32.75 cash.
200 Tons	"	33.00 cash.
200 Tons	Imported	39.25 cash.

Muck Bar.

500 Tons	Muck Bar	33.00 cash.
350 Tons	" "	33.25 cash.
280 Tons	" "	33.00 cash.

Old Iron Rails.

500 Tons	Imported T's	25.00 cash.
500 Tons	" D. H.	25.00 cash.

FINANCIAL.

NEW YORK, Friday Evening, May 6.

The bears have been actively at work this week, but there has been a quiet and very strong absorbing power. The better element on the street looks upon stocks at about present prices as cheap, and it is buying on all slumps. Money is again becoming abundant here, while in London and other European financial centers there is a glut. In London bankers are allowing but ¾ to 1 per cent on deposit, and are making "call" loans at almost any thing they can get. Europe is buying more stocks than it is selling; and with any encouragement from this side, it is thought will be an enormous buyer. Railroad earnings are very satisfactory, and a surprise to bulls and bears alike. The Inter State Commerce law has been a disturbing element, but the momentum to general trade was so great as to prevent any thing like stagnationin any branches. The outlook is exceedingly encouraging, and although we are looking for occasional scares and set backs we think that this is a bull market for stocks, and that before July 1st the entire list will show a higher range. At the present time the market is limited, and may well be called a "traders' market."

The bears are preparing to use the coal miners' strike, in case it occurs next week, to put down prices. It is stated on good authority, and there appears to be evidence of the correctness of the statement, that a bear pool was formed at the Windsor Hotel last night, for the purpose of especially attacking Reading and New England. The manner in which these stocks were taken this afternoon, does not look encouraging for this new combination. The features to the market have been Fort Worth & Denver, which is about 10 per cent higher than when we last wrote, and Rock Island. The advance in Fort Worth is supposed to be due to a short interest. The rise in Rock Island is due to coming rights to subscribe for new stock at par. There has been good buying of Colorado Coal and Iron, and higher prices are looked for. At the meeting of Jersey Central stockholders to-day, the Corbin and the Lehigh Valley people were elected to the management.

The Receivers of the Philadelphia & Railroad Company will purchase, on and after May 9th, 1887, the interest and coupons due in May, of the following divisional coal land mortgage bonds of the Philadelphia & Reading Coal and Iron Company, guaranteed by the Philadelphia & Reading Railroad Company: West Flowery Field, 6 per cent; Big Schall, 5 per cent; Fishing Creek Improvement Company, 5 per cent; Helfenstein, 4 per cent; Raudenbush, Weaver, *et al.*, 4 per cent; Big Pond, 4 per cent; Ely & Riehle, 4 per cent., the rate per annum at which interest or coupon will be purchased.

Mining Stocks.

On the whole, the business of the mining market has been dull and without any interesting features. Attention has been directed only to a few of the stocks. Prices were firm.

Another Colorado property will shortly appear on that market. During the week, the entire capital stock (200,000 shares) of the Montrose Mining Company was taken up in Wall street by strong people inside of 48 hours, it is said. The company's mine is in the Uncompahgre district, near Ouray, Colo. Insiders say that they have a report from an experienced and competent man, and that they are justified in expecting large returns from the property. There were dealings in the stock to-day at 47@50 cents per share. There are indications that this will become a very active stock.

There has been a heavy business in Security, which is accounted for by the fact that the manipulators have pooled their interests, and also by the fact that two thirds or more of the alleged sales have been *washed*. Glowing reports have been circulated on the floor showing the fabulous prospects of ore at the mine, but it is safe to say that very little of the stock is being taken up by the public. As we have already mentioned, the stock would be high at $1, and five cents a share would come nearer to the real value of it. Some 49,956 shares changed hands. Iron Silver has shown more activity than for some time past, selling at from $2.65@$2.75. Little Chief mining stock shows one sale at 90c.; Chrysolite at 55c.; Bassick at 12c.; Robinson Consolidated at 40c.; Lacrosse, 13c.; Silver Cliff was lower at from 18@15c.

Little has been doing in the stock of the Renfrew Mining Company, which shows higher prices at from $1.55@$1.70.

As usual, Sutro Tunnel shows a large business, amounting to some 40,200 shares. The price is steady, at from 25 to 28c. Consolidated California & Virginia advanced from $14.87 to $15, but declined to $14.75 again. Ophir shows a still further advance to $9.13. The other Comstock shares were quiet, and remain unchanged.

The price of the Tuscarora [shares show no great variation. North Belle Isle sold at from $8.38@$8.50, Navajo at $1.15, and Belle Isle at $2.70; Independence at 50@60c. Eureka shows a sale at $6.25.

Homestake has attracted little attention, selling at from $15.87 to $16. Deadwood Terra was dull at $2, and Caledonia at from $1.50 to $1.25.

Santiago shows large sales and advanced from $4.40 to $4.90, closing at from $4.70 to $4.80.

Some interest has been directed to Helena, which has been active at from 85c.@$1.10.

Silver King sold at $9.50.

One sale is recorded of Ontario at $25. A few of Horn-Silver at from $1.05@$1.20.

Middle Bar has been quite active since our last. A very large amount of business has been done. There is no doubt that the stock possesses vitality. Whether the few outsiders who have gone long of the stock have come out without damage is another thing, and the same may be said of those who have ventured short, the wily manipulators of the stock being alert and prepared to work the market with a view only of profiting themselves. Prices have ranged from 84@98c., closing to-day at from 84@86c. The transactions amounted to 85,200 shares. Amador has been active, and declined from $2.05@$1.75. Stanislaus was firm at from $2.60@$2.85, closing at $2.60 to-day.

The Bodies were again entirely neglected. One sale of Bodie is recorded at $2.70; one of Bulwer at $1.30; of Standard, at $1.15 and $1.10; Mono, $2.60; and Consolidated Pacific, at 30c. Plymouth Consolidated remains at from $18.75@$18.87. Several hundred shares of Quicksilver preferred sold at from $31.50@$30.50. Green Mountain was quoted at from 36@38c., and Taylor-Plumas at 5@4c. It was expected that the stock of the Brunswick Gold Mining Company would be called before this at the Consolidated Stock and Petroleum Exchange. The delay is occasioned, it is said, by the fact that arrangements are making to have the stock listed at the Stock Exchange, and the parties interested in this stock intend to have the stock appear on both Exchanges at the same time. A very lively business in this stock is expected.

The Phœnix Mining Company has contracted for a mill, which is expected to be in running order by July. The continued decline in the stock is said to be due to the fact that a prominent Wall street house has orders for a large block, and in order to buy it in at low figures is bearing the stock. Insiders are confident that higher prices will be reached later on, though no particular movement is looked for instantly.

El Cristo has taken another upward turn, advancing on Saturday from $6.50@$7.37, and during the week selling as high as $7.75, closing to-day at from $7@$7.25, showing a large business on both Exchanges. It is stated that the stock may take another sharp upward movement at any time. Good reports are being received from the company's property.

The distribution of the circular to-day issued by the Rappahannock Gold Mining Company was followed by very large trading in the stock, which attracted more attention than at any time since the boom last fall. The price was firm at from 19 to 20c., with sales of 39,400 shares.

Meetings.

The annual and special meetings of the following companies will be held at the times mentioned:

Curtin Oil Company, Room 24, Philadelphia Exchange, Philadelphia, Pa., May 12th, at twelv o'clock M.

Cusihuriachic Mining Company, No. 84 Broadway, Room 9, New York City, May 13th, at twelve o'clock M. Special meeting to take immediate steps for the voluntary dissolution of the company.

Dominion Phosphate Mining Company, Lt., No. 108 St. Francois Xavier street, Montreal, Quebec, Canada, May 17th, at eleven o'clock A.M.

German Land and Mining Company, Rockland, Mich., June 4th, at two o'clock P.M.

DIVIDEND-PAYING MINES.

	Name and Location of Company.		Capital Stock.	Shares. No.	Shares. Par	Assessments. Total levied.	Assessments. Date and amount of last.			Dividends. Total paid.	Dividends. Date and amount of last.		
1	Adams, s. L.	Colo.	$1,500,000	150,000	$10	*				$555,000	Jan.	1886	.10
2	Alice, s. C.	Mont	10,000,000	400,000	25	*				750,000	Sept	1886	.06⅓
3	Amie Con., s. L.	Colo.	5,000,000	500,000	10	*				330,000	Oct.	1883	.05
4	Amy & Silversmith, s.	Mon.		341,419						204,852	Dec.	1886	.10
5	Atlantic, C.	Mich	1,000,000	40,000	25	$280,000	Apl.	1875	$1.00	360,000	Jan.	1887	$1.00
6	Argenta, s	Nev..	10,000,000	100,000	100	295,000	July	1885	.10	40,000	Feb.	1880	.20
7	Aurora, I.	Mich.	1,000,000	40,000	25					40,000	Apl.	1887	1.00
8	Barbee & Walker, s.	Utah	1,000,000	100,000	10	*				60,000	Nov	1880	.10
9	Bassick, G. S.	Colo.	10,000,000	100,000	100	*				400,000	Mar.	1884	1.00
10	Belle Isle, s.	Nev..	10,000,000	100,000	100	160,000	Feb	1887	.20	300,000	Dec.	1879	.25
11	Belcher, G. S.	Nev..	10,400,000	104,000	100	2,217,335	Dec.	1885	.30	15,397,000	Apl.	1876	1.00
12	Bellevue Idaho, S. L.	Idah.	1,250,000	125,000	10	26,250	Dec.	1883	10	200,000	Jan	1887	.10
13	Big B'nd Hydraulic, &	Dak..	1,000,000	200,000	5	*				234,000	Apl.	1887	.03
14	Black Bear, G.	Cal..	3,000,000	30,000	100	22,500	Dec.	1884	.25	895,000	May	1883	.20
15	Bodie Con., G. S.	Cal..	10,000,000	100,000	100	374,990	Jan.	1887	.50	1,662,572	Apl.	1885	.50
16	Bonanza Developm't	C&M	3,000,000	300,000	10					135,000	Oct.	1882	.15
17	Bonanza K'g, Cons. s.	Cal..	1,000,000	100,000	10	*				185,000	Feb.	1885	.10
18	Boston & Mont, G.	Mont	2,500,000	250,000	10	*				520,000	Jun.	1886	.15
19	Breece, s.	Colo.	5,000,000	200,000	25	*				2,000	Feb.	1880	.01
20	Brooklyn Lead, L. S.	Utah	500,000	50,000	10					102,000	Sept	1886	.05
21	Bulwer, G.	Cal.	10,000,000	100,000	10	40,000	Oct.	1885	.20	175,006	Jan.	1884	.10
22	Caledonia, G.	Dak.	10,000,000	100,000	100	505,000	May	1885	.15	40,000	Feb.	1886	.10
23	Calumet & Hecla, C.	Mich	2,500,000	100,000	25	1,200,000				28,850,000	Mar.	1887	5.00
24	Carbonate Hill, S. L.	Colo.	2,000,000	200,000	10	*				80,000	Apl.	1884	.05
25	Caribou Con., S.	Colo.	1,500,000	150,000	10	*				50,000	Mch	1880	.10
26	Castle Creek, G.	Idah.	100,000	100,000	1					51,000	Oct.	1883	.03
27	Catalpa, S. L.	Colo.	3,000,000	300,000	10	*				270,000	May.	1884	.10
28	Central, C.	Mich	500,000	20,000	25	100,000	Sept	1861	.06	1,820,000	Feb.	1887	2.00
29	Christy, S.	Utah	10,000,000	100,000	100					10,000	Jun.	1885	.10
30	Chrysolite, S. L.	Colo.	10,000,000	200,000	50	*				1,650,000	Dec.	1884	.25
31	Colorado Central, S. L	Colo.	2,750,000	275,000	10	*				198,750	Apl.	1887	.05
32	Cons. Cal. & Va., G. S.	Nev..	21,600,000	216,000	100	108,000	Jan.	1885	.20	604,000	May	1887	.50
33	Con. Gold Mining, G.	Ga...	500,000	100,000	5	*				108,000	Nov.	1883	.02
34	Contention, s.	Ariz.	12,500,000	250,000	50					42,587,000	Dec.	1884	.25
35	Crescent, S. L. G.	Utah	15,000,000	600,000	25	‡				210,000	Aug.	1886	.05
36	Crown Point, G. S.	Nev..	10,000,000	100,000	100	2,675,000	Feb.	1882	.25	11,588,000	Jan.	1875	2.00
37	Daly, S. L.	Utah		150,000						112,500	Apl.	1887	.25
38	Deadwood-Terra, G.	Dak..	5,000,000	200,000	25	*				$900,000	Jan.	1883	.10
39	Derbec B. Grav., G. S.	Cal..	10,000,000	100,000	100	90,000	Dec.	1881	.10	140,000	Jun.	1886	.10
40	Dunkin, S. L.	Colo.	5,000,000	200 000	25	*				220,000	Sept	1884	.05
41	Elkhorn, G. S.	Mont	1,000,000	100,000	10	50,000	July	1883	.50	175,000	May	1887	.05
42	Eureka Con., G. S. L.	Nev..	5,000,000	50,000	100	500,000	July	1886	1.00	4,817,500	July	1882	.25
43	Evening Star, S. L.	Colo.	500,000	50,000	10	*				1,400,000	Nov	1883	.50
44	Excelsior, G.	Cal..	10,000,000	100,000	100	560,000	Sept	1885	1.00	875,000	Oct.	1880	.25
45	Father de Smet, G.	Dak..	10,000,000	100 000	100	200,000	Nov.	1878	1.00	1,125,000	Dec.	1885	.20
46	Franklin, C.	Mich	1,000,000	40,000	25	220,000	Jun.	1871		560,000	Dec.	1886	1.00
47	Freeland, G. S. C.	Colo.	5,000,000	200,000	25	*				190,000	July	1886	.10
48	Fresno Enterprise, G	Cal..	5,000,000	100,000	50					110,000	July	1882	.10
49	Garfield Lt., G. S.	Nev.	500,000	100,000	5		Mch	1883	.10	25,000	Mar.	1885	.12½
50	Gould & Curry, G. S.	Nev..	10,800,000	108,000	100	4,109,000	Mar.	1887	.50	3,826,000	Oct.	1870	10.00
51	Grand Central, S.	Ariz.	1,000,000	100,000	10					625,000	Dec.	1882	.25
52	Grand Prize, S.	Nev..	10,000,000	100,000	100	570, 00	Apl.	1886	.50	495,000	Mar.	1884	.25
53	Granite, S.	Colo.	125,000	125,000	1					6,250	May	1883	.01
54	Granite Mountain, S.	Mont	10,000,000	400,000	25					2,300,000	May	1887	.50
55	Green Mountain, G.	Cal..	1,250,000	125,000	10	*				212,000	Nov.	1881	.07½
56	Hale & Norcross, G. S	Nev..	11,200,000	112,000	100	5,030,800	Mar.	1887	.50	1,598,000	Apl.	1871	5.00
57	Hall-Anderson, G.	N. S.	150,000	150,000	1					7,000	Jan.	1882	.05
58	Hecla Con., S. & L. C.	Mont	1,500,000	30,000	50					1,182,000	May	1887	.50
59	Hel'a Mg & Red, G. & L	Mont	3,315,000	663,000	5	*				197,973	July	1886	.06
60	Holmes, S.	Nev..	10,000,000	100,000	100	300,000	Sept	1885	10	75,000	Apl.	1886	.25
61	Holyoke, G.	Idah	200,000	200,000	1					27 000	Feb.	1883	.10
62	Homestake, G.	Dak..	12,500,000	125,000	100	200,000	July	1878	1.00	3,793,750	Apl.	1887	.20
63	Honorine, S. L.	Utah	500,000	250,000	2	25,000	Jun.	1883		100,000	Apl.	1887	.05
64	Hope, S.	Mont	400,000	8,000	50	*				158,252	Oct.	1884	1.50
65	Horn-Silver, S. L.	Utah	10,000,000	400,000	25	*				4,000,000	Nov.	1884	.50
66	Idaho, G.	Cal..	310,000	3,100	100					4,539,500	Apl.	1887	5.00
67	Ideal, S. L.	Colo.	1,500,000	150,000	10					15,000	Oct.	1886	.05
68	Illinois, S.	N.M.	100,000	100,000	1	*				25,000	Jan.	1887	.25
69	Independence, S.	Nev..	10,000,000	100,000	100	340,000	Oct.	1886	.20	225,000	Sept	1879	.25
70	Indian Queen, S.	Nev..	250,000	125,000	2					368,750	July	1883	.03
71	Inyo, G.	Cal..	500,000	100,000	5	*				45,000	Apl.	1882	.05
72	Iron Hill, S.	Dak.	2,500,000	250,000	10	82,500	Oct.	1885		112,500	Oct.	1886	.05
73	Iron-Silver, S. L.	Colo.	10,000,000	500,000	50	*				1,900,000	Mar.	1887	.20
74	Jackson, G. S.	Nev.	5,000,000	50,000	100	10,000	Nov.	1880	.20	45,000	Oct.	1886	.10
75	Jocuistita, S.	Mex.	2,500,000	250,000	10					1,200,000	Feb.	1885	.50
76	Jumbo, G.	Colo.	2,000,000	200,000	10	*							
77	Kentuck	Nev..	3,000,000	30,000	100	342,000	Nov	1881	.30	1,600,000	Dec.	1886	.10
78	La Plata, S. L.	Colo.	2,000,000	200,000	10	*				610,000	Sept	1882	.30
79	Leadville Cons., S. L.	Colo.	4,000,000	400,000	10	*				430,000	Apl.	1887	.05
80	Lexington, G. S.	Mont	4,000,000	40,000	100	*				565,000	Jan.	1885	2.00
81	Little Chief, S. L.	Colo.	10,000,000	200,000	50	*				780,000	Mch	1885	.10
82	Little Pittsburg, S. L	Colo.	20,000,000	200,000	100	*				1,050,000	Mch.	1880	50
83	Manhattan, S.	Nev	5,000,000	50,000	100	250,000	Mar.	1887	1.00	437,500	Feb	1886	.25
84	Marguerite, G.	Cal..	500,000	25,000	20					18,750	Oct.	1882	.25
85	Marion Bullion, G.	N.C.	500,000							15.000	Jan.	1885	
86	Martin White, S.	Nev..	10,000,000	100,000	100	1,150,000	Mar.	1886	25	140.000	Dec.	1886	.25
87	Mary Murphy, G. S.	Colo.	350,000	3,500	100	*				70,000	Apl.	1887	5.00
88	Minnesota, C.	Mich	1,000,000	40,000	25	420,000	Apl.	1886	1 00	1,820,000	Mar.	1876	
89	Mono, G.	Colo.	5,000,000	50,000	100	585,000	Mar.	1887	.50	12.500	Mar.	1886	.25
90	Montana, Lt. G. S.	Mont	3,300,000	330,000	10	*				999,900	Jan.	1887	.02
91	Morning Star, S. L.	Colo.	1,000,000	100,000	10					675,000	Dec.	1886	.25
92	Moulton, S. G.	Mont	2,000,000	400,000	5	*				350,000	May	1887	.07½
93	Mount Pleasant, G.	Cal.	150,000	150,000		*				150.000	Feb.	1887	.30
94	Mt. Diablo, S.	Nev.	5,000,000	50,000	100	137,500	Jun.	1880	2.00	80,000	July	1885	.20
95	Napa, Q.	Cal..	700,000	100,000	7					290,000	Jan.	1883	.10
96	Navajo, G. S.	Nev..	10,000,000	100,000	100	450,000	Mar.	1887	.30	325,000	Feb.	1885	.25
97	N. Hoover Hill, G. S.	N. C.	300,000	120,000	2½	*				30,000	Dec.	1885	.06⅓
98	New York Hill, G.	Cal..	5,000,000	50,000	100	62,500	Oct.	1885	.15	215,000	Aug.	1882	.10
99	Northern Belle, S.	Nev..	5,000,000	50,000	100	425,000	Jan.	1884	8.30	2,400,000	Apl.	1883	50
100	North Belle Isle, S.	Nev..	10,000,000	100,000	100	250,000	Mar.	1887	.50	30,000	Aug.	1881	.15
101	Ontario, S. L.	Utah	15,000,000	150,000	100					8,225,000	Apl.	1887	.50
102	Ophir, G. S.	Nev..	10,000,000	100,000	100	4,007,800	Dec.	1886	.50	1,595,000	July	1882	1.00
103	Original, S. C.	Mont	1,500,000	60,000	25	*				114.000	Oct.	1884	.05
104	Osceola, C.	Mich	1,250,000	50,000	25	480,000	Apl.	1876	1.60	1,022,500	Jan.	1887	1 00
105	Oxford, G.	N. S.	125,000	125,000	1	*				34,500	Oct.	1885	.02
106	Paradise Valley, G. S	Nev.	10,000,000	100,000	100	47,000	Mar.	1882	.15	150,000	Apl.	1887	.10
107	Peacock, S. G. C.	N.M.	2,000,000	200,000	10	*				60,000	Nov.	1886	
108	Pleasant Valley, G. S.	Cal..	10,000,000	100,000	100	40,000	Mar.	1884	.10	30,000	Dec.	1882	.05
109	Piutus, G. S. C. L.	Colo.	2,000,000	200,000	10	*				20.000	Feb.	1886	.10
110	Plymouth Con., G.	Cal..	5,000,000	100,000	50	*				1,950,000	May	1887	.25
111	Prussian, S. L.	Colo.	1,500,000	150,000						132,000	Jan.	1883	.10
112	Quicksilver, pref., Q.	Cal..	4,300,000	43,000	100					849,650	Jan.	1887	1.50
113	" com., Q.	Cal..	5,700,000	57,000	100					151,000	July	1882	.40
114	Quincy, C.	Mich	1,000,000	40,000	25	200,000	Dec.	1863		4,570,000	Jan	1887	4.00
115	Richmond, S. L.	Nev..	1,350,000	54,000	25	*				4,245,087	Dec.	1886	1.25
116	Ridge, C.	Mich.	500,000	20,000	25	220,000	Mar	1886	.50	100,000	Feb.	1880	.50
117	Rising Sun, S.	Dak..	750,000	150,000	5	*				52,000	May	1881	.07½
118	Robinson Con., S. L.	Colo.	10,000,000	200,000	50	*				585,000	Mar.	1886	.05
119	Robert E. Lee, S. L.	Colo	10,000,000	500,000	20					100,000	Dec.	1882	.10
120	Rooks, G.	Vt...	500,000	50,000	10	*				61,000	Apr.	1885	.30
121	San Francisco, C.	Cal..	5,000,000	50,000	100	45,000	Sept	1880	.50	20,000	Feb.	1883	.05
122	Savage, S.	Nev..	11,200,000	112,000	100	6,212,000	Mar.	1887	.50	4,460,000	July	1869	3.00
123	Security L. Mg., Mfg.	Colo.	1,000,000	100,000	10	*				50,000	July	1884	
124	Shoshone, G.	Idah.	150,000	150,000	1					7,500	Apl.	1883	.01
125	Sierra Buttes, G.	Cal..	225,000	22,500	10					1,438,964	Oct.	1886	.37
126	Sierra Grande, S.	N. M.	2,500,000	500,000	5					860,000	Sept	1884	.25
127	Sierra Nevada, G. S.	Nev..	10,000,000	100,000	100	6,237,000	Apl.	1887	.50	102,000	Jan.	1871	1.00
128	Silver Cord, G. S. L.	Colo.	5,000,000	500,000	10					225,000	Nov.	1883	.25
129	Silver King, S.	Ariz.	10,000,000	100,000	100					1,925,000	Apl.	1887	.25
130	Silverton, G. S. L.	Colo.	2,000,000	200,000	10	*				76,000	Nov.	1886	.02
131	Small Hopes Cons., S.	Colo.	5,000,000	250,000	20	*				2,662,500	Mar.	1887	.20
132	Smuggler, S. L.	Colo.	600,000	60,000	10					66,700	Aug.	1883	.25
133	Socorro, C.	N. M.	250,000	2,500	100					4,000	Mch	1882	.00¾
134	South Yuba, G.	Cal..	2,000,000	40,000	50	*				150,000	Oct.	1881	.75
135	Spring Valley, G.	Cal..	200,000	200 000	1	50,000	Oct.	1886	.25	50,000	Jan.	1881	.25
136	Standard, G. S.	Cal..	10 000,000	100,000	100	25,000	Oct.	1884	.25	4,425,000	Mar.	1884	.25
137	Stormont, S.	Utah	500,0 00	500,000	1	*				155,000	Nov.	1881	.05
138	St. Joseph, L.	Mo..	1,500,000	150,000	10	*				754,000	Mar.	1887	.20
139	Syndicate, G.	Cal..	10,000,000	100,000	100	38,729	July	1882	.15	48,308	Sept	1885	.10
140	Tip Top, S.	Ariz.	10,000,000	100,000	100	250,000	Sept	1883	.25	100,000	Nov.	1881	.20
141	Tombstone, G. S. L.	Ariz	12,500,000	500,000	25	*				1,250,000	Apl.	1882	.10
142	True Fissure, G. S. L.	Utah	1,500,000	150,000	10	*				75,000	Jun.	1883	.15
143	United Verde, C.	Ariz.	3,000,000	300,000	10	*				97,500	Feb.	1884	.20
144	Valencia, M.	N. M.	150,000	1,500	100	*				37,500	Apl	1886	2.50
145	Viola Lt., S. L.	Idah.	750,000	150,000	5	*				74,500	May	1887	.12½
146	Vizina, S.	Ariz.	5,000,000	200,000	25	*				140,000	Apl.	1882	.10
147	Yankee Girl	Colo.	2,500,000	250,000	10					1,075,000	Jan	1887	.05
148	Yellow Jacket, G. S.	Nev..	12,000,000	120,000	100	5,448 000	Dec.	1885	.75	2,184,000	Aug.	1871	1.50

NON-DIVIDEND-PAYING MINES.

	Name and Location of Company.		Capital Stock.	Shares. No.	Shares. Par Value.	Assessments. Total levied.	Assessments. Date & am'unt of last.		
1	Agassiz Cons., S. L.	Colo.	$2,500,000	50,000	$50	*			
2	Albion, S. L.	Nev..	15,000,000	150,000	100	$577,000	July	1883	.50
3	Allouez, C.	Mich	2,000,000	80,000	25	240,000	Feb.	1884	.50
4	Alpha Con., G. S.	Nev..	3,000,000	30,000	100	445,000	Jan.	1887	.50
5	Alta, S.	Nev..	10,080,000	100,800	100	2,027,000	Feb.	1887	.50
6	Amador, G.	Cal..	400,000	200,000	2	*			
7	American Flag, S.	Colo.	1,250,000	125,000	10	300,000	Jun.	1877	.25
8	Anglo-Montana, Lt.	Mon.	600,000	120,000	5				
9	Appalachian, Lt., G.	N. C.	1,500,000	300,000	5				
10	Aspen Mg. & S., S. L.	Colo.	2,000,000	200,000	10				
11	Barcelona, G.	Nev..	5,000,000	200,000	25	*			
12	Bear Creek	Cal..	300,000	300,000	1				
13	Bechtel Con., G.	Cal..	10,000,000	100,000	100	173,500	Jan.	1883	.10
14	Belmont, S.	Nev..	5,000,000	50,000	100	735,000	Apl.	1886	.10
15	Best & Belcher, G. S.	Nev..	10,080,000	100,800	100	1,798,990	Mar.	1887	.50
16	Big Pittsburg, S. L.	Colo.	20,000,000	200,000	100	*			
17	Bi-Metallic, S.	Mon.	5,000,000	200,000	25	*			
18	Black Jack, G.	Cal..	250,000	100,000	2½				
19	Bonanza Chief	Mon	1,000,000	1,000,000	1	*			
20	Bondholder	Colo.	500,000	200,000	2½				
21	Boston Con., G.	Cal..	10,000,000	100,000	100	170,000	Nov	1883	.25
22	Bradshaw, S.	Ariz.	2,250,000	225,000	10				
23	Brunswick, G.	Cal..	2,000 000	400,000	5	*			
24	Bullion, G. S.	Nev..	10,000,000	100,000	100	5,000,000	Jan.	1887	.40
25	Bve and Bye	Ariz.	1,000,000	100,000	10	*			
26	Calaveras, G.	Cal..	500,000	500,000	1	*			
27	Carisa, G.	Wy..	500,000	100,000	5	*			
28	Cen Contin'l, G. S. L.	C.&A	2,000,000	200,000	10	*			
29	Charles Dickens.	Idah.	1,250,000	250,000	5				
30	Cherokee, G.	Cal..	1,500,000	150,000	10				
31	Chollar, S.	Nev..	11,200,000	112,000	100	1,096,000	Nov	1886	.50
32	Cinnamon Mt., G. S.	Colo.	750,000	150,000	5				
33	Climax, S. L.	Colo.	2,000,000	200,000	10	*			
34	Colorado No. 2, S. L	Colo.	100,000	10,000	10				
35	Con. Imperial, G. S.	Nev..	50,000,000	500,000	100	1,100,000	Aug.	1886	.10
36	Con. Pacific, G.	Cal..	6,000 000	60,000	100	174,000	Feb.	1886	.15
37	Cons. Silver, S.	Mo..	2,500,000	250,000	10				
38	**Con. Queen Cons, C.	Ariz.	1,400 000	140,000	10				
39	Courtlandt	Colo.	500,000	50,000	10				
40	Crescent, S. L.	Colo.	3,000,000	300,000	10	*			
41	Crocker, S.	Ariz.	10,000,000	100,000	100	65,000	May	1886	.20
42	Crowell, G.	N. C.	500,000	500,000	1				
43	Dahlonega, G.	Ga...	250,000	250,000	1	*			
44	Dandy, S.	Colo.	5,000,000	500,000	10				
45	Dardanelles, G.	Cal..	1,000,000	100,000	10				
46	Decatur, S.	Colo.	1,500,000	300,000	5	*			
47	Denver City, S. L.	Colo.	5,000,000	500,000	10	*			
48	Denver Gold	Colo.	300,000	60,000	5				
49	Deseret, G. S.	Utah	500,000	50,000	10	*			
50	Dunderberg, S.	Colo.	1,500,000	150,000	10	*			
51	Durango, G.	Colo.	500,000	500,000	1	*			
52	Durango T.	Mex.	120,000	1,200	100				
53	Eastern Dev. Co., Lt.	N. S.	1,500,000	150 000	10	990,000	Mar.	1886	1.00
54	El Cristo, G. S.	U.S.C	1,000,000	500,000	2				
55	Empire Lt., G.	Mon.	500,000	100,000	5				
56	Empire, S.	Utah	10,000,000	100,000	100				
57	Enterprise, S. L.	Colo.	800,000	80,000	10	*			
58	Eureka Tunnel, S. L.	Nev..	10,000,000	100,000	100	*			
59	Exchequer	Nev.	10,000,000	100,000	100	860,000	Oct.	1886	.20
60	Gold Cup, S.	Colo.	500,000	500,000	1	*			
61	Gold Placer, G.	Colo.	5,000,000	200,000	2 5	229,314	Dec.	1885	.25
62	Goodshaw, G.	Cal..	10,000,000	100,000	100	*			
63	Grand Belt, C.	Tex.	12,000,000	120,000	100				
64	Grand Duke	Colo.	800,000	80,000	10				
65	Gregory-Bobtail, G.	Colo.	550,000	550,000	1	*			
66	Gregory Con., G.	Mon.	3,000,000	300,000	10				
67	Harlem M. & M. Co, G.	Cal..	1,000,000	200,000	5				
68	Head Cent. & Tr. S. G	Ariz.	10,000,000	100,000	100				
69	Highland, C.	Mich	500,000	25,000	25				
70	Hortense, S.	Colo.	2,000,000	200,000	10				
71	Iron Gold & Silver, S	N. M.	2,000,000	200,000	10				
72	Iroquois, C.	Mich	1,250,000	50,000	25	*			
73	J. D. Reymert	Ariz.	10,000,000	100,000	100	*			
74	Julia Cons., G. S.	Nev..	11,000,000	110,000	100	1,454,500	Apl.	1887	.15
75	Kearsarge, C.	Mich	1 250,000	50,000	25	100,000	Apl.	1886	5.00
76	Laclede	N. M.	2,000,000	200,000	10				
77	Lacrosse, G.	Colo.	1 000,000	100,000	10	*			
78	Lee Basin, S. L.	Colo.	5,000,000	500,000	10	*			
79	Leviathan, S.	Nev..	10,000,000	100,000	100	380,000	Sept	1882	.25
80	Lucerne, S.	Colo.	5,000,000	500,000	10	*	Jan.	1885	.10
81	Mammoth Bar., G.	Cal..	10,000,000	100,000	100	50,000	Dec.	1881	
82	Mariposa pref., G.	Cal..	5,000,000	50,000	100	1,687,500	Feb.	1883	.25
83	" common, G.	Cal..	10,000,000	100,000	100	1,975,000	Dec.	1881	.20
84	May Belle, G.	Cal..	10,000,000	100,000	100	84,000	Mar.	1884	.15
85	Mayflower Gravel.	Cal..	1,000,000	100,000	10	160,000	Mar.	1887	.25
86	Mexican, S. S.	Nev..	10,000,000	100,000	100	2,590,960	Jan.	1887	.25
87	Middle Bar, G.	Cal.	400,000	200,000	2	*			
88	Mike & Starr, S. L.	Colo.	1,000,000	200,000	5	*			
89	Miner Boy, G. S. L.	Colo.	5,000,000	500,000	10	*			
90	Miller	Nev.	5,000,000	200,000	25				
91	Moose Silver, S.	Colo.	3,000,000	300,000	10	*			
92	Nachoochee, Lt., G.	Ga..	1,000,000	200,000	5				
93	Neath, G.	Colo.	1,000,000	100,000	10				
94	Nevada Queen, S.	Nev.	10,000,000	100,000	100	80,000	Mar	1887	.50
95	New Germany, G.	N. S.	100,000	100,000	1	*			
96	New Pittsburg, S. L.	Colo.	2,000,000	200,000	10	*			
97	North Standard, G.	Cal..	10,000,000	100,000	100	20,000	Nov		
98	Noonday	Cal..	600,000	60,000	10	208,000	Dec.	1881	.10
99	Old Dominion, C.	Ariz.	3,000,000	300,000	10				
100	Oriental	Nev..	2,000,000	200,000	10				
101	Oriental & Miller, S.	Nev..	10,000,000	400,000	25				
102	Overman, G. S.	Nev..	11,520,000	115,200	100	3,736,880	Jan.	1887	.30
103	Parrott, C.	Mon.	1,800,000	180,000	10				
104	Park, S.	Utah	2,000,000	200,000	10				
105	Peer, S.	Ariz.	10,000,000	100,000	100	135,000	Nov.	1886	.10
106	Peerless, S.	Ariz.	10,000,000	100,000	100	295,000	Nov.	1886	.20
107	Phœnix	Ariz.	500,000	500,000	1				
108	Phœnix Lead.	Colo.	100,000	100,000	1				
109	Potosi	Nev..	11,200,000	112,000	100	1,145,600	Mar.	1887	.30
110	Puritan, S. G.	Colo.	1,500,000	150,000	10	*			
111	Quincy	Colo.	3,000,000	300,000	10				
112	Rappahannock, G. S.	Va..	250,000	250,000	1	*			
113	Red Elephant, S.	Colo.	500,000	500,000	1	*			
114	Rollins, G. S.	Colo.	5,000,000	200,000

NEW YORK MINING STOCK QUOTATIONS.

DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY.	April 30.		May 2.		May 3.		May 4.		May 5.		May 6.		SALES.
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Alice, Mon													
Argenta, Nev.	.40		.41						.38	.35	.36		3,200
Passick, Colo.					.12								100
Belcher													
Belle Isle, Nev.													
Bodie Cons., Cal.									2.70				100
Breece, Colo.													
Bulwer, Cal					1.30								100
Caledonia, Dak.									1.50		1.25		600
Chollar, Nev.													
Chrysolite, Colo.					.65								100
Colorado Cent'l, Colo.													
Cons. Cal. & Va., Nev.	14 87						15.00		15.00	14.75	14.87		375
Crown Point, Nev													
Deadwood, Dak									2.00				100
Dunkin, Colo.													
Eureka Cons., Nev			6.25						6.25				250
Father de Smet, Dak.													
Freeland, Colo.													
Gold Stripe, Cal													
Gould & Curry, Nev.													
Green Mountain, Cal.	.38	.37							.38	.36			1,700
Hale & Norcross, Nev.	5.25												100
Helena					1.10	1.00	1.00	.85			1.10	.95	4,600
Homestake, Dak.	15.87				16.00								100
Horn-Silver, Ut.	1.20				1.05						1.15		525
Independence, Nev.	.60	.50											200
Iron Hill, Dak													
Iron Silver, Colo.					2.70		2.65		2.75		2.75		1,000
Leadville C., Colo.													
Little Chief, Colo			.29										600
Little Pittsburg, Colo.													
Martin White													
Moulton, Mont.													
Navajo, Nev.									1.15		1.15		200
North Belle Isle, Nev.			8 38						8.50				125
Ontario, Ut											25.00		100
Ophir, Nev.	9.13												100
Plymouth, Cal.					18.75		18.87	18.75	18.87		18.75		900
Quicksilver Pref., Cal.	31.50		31.25		31.25				31.38	31.25	30.50		900
" Com., Cal													
Robinson Cons., Colo.									.40		.40		200
Savage, Nev.													
Sierra Nevada													
Silver King, Ariz			9.50								9.50		50
Standard, Cal.			1.15						1 10				400
Stormont, Ut.													
Yellow Jacket, Nev.							4.75		4.75		4.65		400

NON-DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY	April 30.		May 2.		May 3.		May 4.		May 5.		May 6.		SALES.
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Alta													
Amador, Cal.	1.80		2.05	1.80	2.00		1.95	1.85	1.90	1.80	1.80	1.75	16,500
Am. Flag, Colo.													
Barcelona, Nev.													
Bechtel Con., Nev.													
Belcher, Nev													
Best & B'cher, Nev.	7.13								7.13				400
Big Pittsb'g, Colo.													
Bullion, Nev.													
Bull-Dom'go, Colo.													
Castle Creek, Id.	.20										.20		1,000
Central Ariz., Ariz.											.12	.13	200
Columbia & Beaver													
Cons. Imperial, Nev.													
Con. Pacific, Cal.	30												100
Decatur													
Durango													
Eastern Oregon	.03				.03								2,500
El Cristo, U. S. Col.	7.37	6.50	7.50	7.00	7.50	7.00	7.75	7.13	7.38	7.25	7.25	7.00	27,900
Gold Placer													
Holyoke	.16	.14	.15		.15		.15	.13	.16	.15	.16		15,700
Julia, Nev.													
Justice, Nev.													
Kossuth, Nev													
Lacrosse, Colo											.13		800
Mexican, Nev.													
Middle Bar, Cal.	.92	.87	.95	.93	.96	.95	.98	.88	.90	.80	.86	.84	85,200
Mono, Cal												2.60	100
New Germany, N.S.	.43		.43		.44	.43	.43		.44	.43	.44	.42	4,600
New Pittsb'g, Colo													
North Stand'd, Cal.													
N. Horn-Silv'r, Ut.													
Ori'nt'l&Mil'r, Nev.											.20		100
*Phœnix, Ariz.	4.25	3 00	3 50	2 87	3.25	2.50	3.00	2 50	2.75	2.37	3.00	2.50	108,005
Potosi, Nev.													
Rappahannock, Va	.20		.18		.19	.18	.19	.18			.20	.19	39,400
Red Elephant	.04				.03		.03						4,900
Renfrew	1.55		1.60		1 60		1.65		1.70		1.70		1,400
Saint Kevin													
Santiago	4 75	4 40	4.90	4.70	4.90	4 70	4.85	4.70	4.85	4.75	4.80	4.70	18,820
Security, Colo.	7.25	6.13	7.25	6 50	7.37	6.87	7.50	6.75	7 25	6.75	7.25	6.75	49,950
Silver Cliff, Colo	.18		.18	.17	.17		.17		.16		.15		2,400
Silver Leaf			.51	.49	.52	.51	.54	.53					700
Silver Queen			.16		.16			.17					700
Stanislaus, Cal.	2.65	2 60	2 75	2.65	2 80	2.75	2.85	2 75	2.75	2.60	2.65	2.60	4,000
State L'e, I. & t., Nev.					.04		04						200
" Nos. 2 & 3, Nev.													
Sutro Tunnel, Nev.	.27	.25	.27	.26	.28	.27	28	.27	.27		.27	.26	40,200
Taylor Plumas, Cal.	.05				05	.04							6,400
Unadilla, Colo													
Union Cons., Nev.													

* Dealt in at the New York Stock Exchange Unlisted Securities.

BOSTON MINING STOCK QUOTATIONS.

NAME OF COMPANY.	April 29.		April 30.		May 2.		May 3.		May 4.		May 5.		SALES.
Amie													
Allouez	1.63		1.63										200
Atlantic			9.00										100
Bodie													
Bonanza D.	1.63		1.63		1.50		1.63		1.50		1.50		1,100
Boston & Montana	4.00												50
Breece					42½		.45						300
Calumet & Hecla	210				212				210		210	209	127
Catalpa	.30	.27½			.32								600
Central													
Chrysolite													
Con. Virginia													
Dunkin	.40		38		.38		.40						1,300
Eureka													
Franklin	10 50	10.13			10.50						10.13		285
Freeland													
Helena													
Ironton Iron Co.	8.00				9.13				8.25		8.00		320
Kearsarge													
Osceola					24.75	24.63	24.00		24.00		24.00		325
Pewabic													
Quincy	46.00				46.50	46.00	46.00						165
Robinson													
Security	6.25		6.25		7.25	6.88	7.00						415
Silver King													
Standard													
Stormont			.11				.11						600

NAME OF COMPANY.	April 29.		April 30.		May 2.		May 3.		May 4.		May 5.		SALES.
Arnold													
Bijou													
Blue Ridge											.19		100
Bowman Silver			.06				.06						1,700
Brunswi'k Antim'y													
Cliff													
Con. Pacific													
Crescent			.10		.11								700
Cusi			.19		.19		.20		.18				1,200
Decatur													
Empire													
Fern													
Honorine													
Huron			.87½		1.00				87½		.75	37½	600
Mesnard													
Mona													
Napa	1.38	1.00	1.38										635
National													
Native													
Oriental & Miller			.20		.20				.20				1,300
Phœnix													
Ridge													
Rappahannock			.20		.20		.20		.20				1,100
St. Mary's													
Sutro Tunnel													
Tamarack									.90				25
Taylor Plumas													

New York: Dividend shares sold, 17,125. Non-dividend shares sold, 432,181. Total New York, 449,306
Boston: Dividend shares sold, 5,827. Non-dividend shares sold, 7,360. Total Boston, 13,187.

COAL STOCKS.

NAME OF COMPANY.	Par value of shares.	April 30.		May 2.		May 3.		May 4.		May 5.		May 6		Sales.
		H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Barclay Coal														
Cameron Coal	50					46¾	46½	46½						400
Col., C. & I	100	49⅝	48¼	49	47¾	48⅞	47¾	48¾	48¼	50	48½	49¾	48¾	25,640
Ches. & O. RR	100	8		8				8	7½					
*Chic. & Ind. Coal RR.								63½		64½	64			175
Col. & Hocking Coal		48⅝	48¼	47⅛	45⅛	46¾	46	47	46¼	47	46¾	47⅛	47	6,462
Consol. Coal	100													
Cumb. C. & I.	100													
Del. & H. C.	100	104⅞	104⅝	104⅝	104	104	103⅞	103⅞	103¾	104¼	103⅞	104¼	104⅛	4,094
D., L. & W. RR.	50	138⅛	137¾	137⅞	137¼	137⅝	136⅞	137½	137	137⅞	137⅝	137⅞	137½	31,485
Elk Lick Coal Co														
Hocking Valley	100			31¾	31⅜			30⅞	30½	32	31½	32½	31⅞	1,925
Lehigh C. & N.†	50			50⅝	50⅜	50⅞	50¾	51		51	50⅞			830
Lehigh Valley RR.†	50	55⅝	55½			56		56	55¾	55⅝				396
L. & W. C. & I. Co														
Maryland Coal	100													
Montauk Coal	100													
Morris & Essex	50					139⅞	139¼	139⅞		140				535
New Central Coal	100	14¼												50
N. J. C. RR.	100	81¾	80½	81	80½	80¾	79¾	81¾	80⅝	82¾	81¾	82½	81¾	23,263
N. Y. & S. Coal	50													
N. Y., Susq. & Western	100			12¾		12⅜		13		13¼	13	13½	13⅛	1,655
Do. pref	100			37¼		37		37		37				
N. Y. & Perry C. & I.	100							70½	70¼					200
Norfolk & Western R R.	100			23⅜								21¼	20¾	500
Do. pref	100	51⅞	51⅝	51⅝	51¼	51¾	51½	51⅝		52	51¾	52¼	52	3,300
Penn. Coal	50													
Penn. RR.†	50	59⅝	59¼	59⅜	59⅛	59½	59¼	57¾	57⅛	58¼	57¾			25,768
Ph. & R. RR.**	50	46¼	45⅝	45⅞	45	45⅝	44¼	45½	44⅛	46	45⅛	45⅞	44⅞	341,014
Spring Mountain	50													
Tennessee C. & I. Co.	100	45	44½	44¼	44⅛	44	43	42⅛	41	44	42¾	43	42	2,900
Westmoreland Coal†	50													

** Of the sales of this stock, 46,099 were in Philadelphia, and 294,915 in New York.
† The quotations for these stocks are not percentage, but actual price.
* Dealt in at the New York Stock Exchange, Unlisted Securities.

Total sales, 470,587.

San Francisco Mining Stock Quotations.

COMPANY.	CLOSING QUOTATIONS. April 29.	April 30.	May 2.	May 3.	May 4.	May 5.
Albion						
Alpha						
Alta	2½	2⅛	2½	2½	2¾	2⅝
Argenta						
Bechtel						
Belcher						
Belle Isle						
Best & Belcher	6⅞	6⅞	6⅝	6½	7	6⅝
Bodie	2¾	2¾	2⅞	3	3	2⅝
Bulwer	1¼		1⅝	1½	1⅝	1¼
Chollar	7⅛	7¼	6⅞	6¾	6¾	6¾
Con. Cal. & Va.	14⅝	15	14½	14½	14½	14¼
Con. Pacific	.35			.30		
Crown Point		5¼	5⅞	5½	5⅝	5½
Eureka Cons	6		6			6¼
Gould & Curry	4¼	4¼	4⅛	4	4¼	4¼
Grand Prize						
Hale & Norcross	5	5⅛	4⅝	4¾	5	4¾
Martin White						
Mexican	5	5⅛	4¾	4¾	4⅞	4⅞
Mono	2½	2⅝	3	3	3	2⅝
Mount Diablo	4¼	4¼	4¼	4¼		
Navajo	1¼	1¼	1¼		1¼	1¼
Ophir	8⅜	8⅛	8	7⅞	8⅛	8⅛
Potosi	7⅝	7¾	7⅝	7¾	7⅝	7¾
Savage	5¾	5¾	5⅝	5½	5⅝	5⅝
Scorpion						
Sierra Nevada	3⅝	3⅝	3⅝	3½	3½	3⅝
Sutro Tunnel						
Tip Top						
Union Cons	3	3	3	3⅛	3⅛	3¼
Utah	1	1⅛	1	.95	1	1
Yellow Jacket	4¾	5	5⅛	5	4⅞	4¾

Dividends.

Consolidated California & Virginia Mining Company, of Nevada, has declared a dividend, No. 6, of fifty cents per share, or $108,000, payable in San Francisco.

Granite Mountain Mining Company, of Montana, has declared a dividend, No. 29, of fifty cents per share, or $200,000, payable May 10th, at St. Louis.

Lehigh & Wilkes Barre Coal Company, of Pennsylvania, will pay three and one-half per cent interest on the registered income bonds, May 23d, at No. 160 Broadway, New York City.

Silver King Mining Company, of Arizona, has declared a dividend, No. 67, of twenty-five cents per share, or $25,000, payable in San Francisco.

Assessments.

COMPANY.	No.	When levied.	Delinquent in office.	Day of sale.	Amount.
Baker Divide, Cal...	13	Mar. 19	Apr. 19	May 9	.25
Bodie Tunnel, Cal...	14	Mar. 2	*Ap. 27	*M'y 20	.25
Confidence.....	....	Apr. 7	.....	.....	.50
Cons. Washoe, Nev..	2	Mar. 24	Apr. 28	May 14	.10
General Crook, Dak.	4	Apr. 18	June 1	June 18	¼
Golden Prize, Nev...	7	Mar. 28	Apr. 27	May 28	.40
Hartshorn, Dak.....	1	Mar. 26	May 21	June 10	½
Homeward B., Dak..	3	Mar. 18	Apr. 23	May 10	¼
Julia, Nev.....	22	Apr. 18	May 24	June 16	.15
Liberty, Dak	4	Mar. 15	May 2	May 19	.01
Manhattan, Nev.....	5	Mar. 23	Apr. 25	May 10	1.00
May Flower, Cal.....	35	Mar. 23	Apr. 25	May 16	.25
Mono, Cal.....	23	Mar. 31	May 5	June 2	.50
Navajo, Nev.....	17	Mar. 14	Apr. 21	May 13	.25
North Belle Isle, Nev	12	Mar. 14	Apr. 19	May 11	.50
Phil Sheridan, Nev..	1	Apr. 18	May 25	June 15	.10
Pocahontas, Dak ...	3	Apr. 11	May 15	June 5	¼
Ruby Bell, Dak.....	3	Apr. 18	May 21	June 6	½
Sampson, Utah.....	....	Mar. 7	Apr. 11	May 8	.25
Scorpion, Nev.....	....	Apr. ..	.....	.....	.10
Sierra Nev., Nev....	88	Apr. 13	May 18	June 6	.25
Trojan.....	....	May 5	.....	.....	.10
Union Cons. Nev	35	Mar. 31	May 6	May 26	.25
Utah, Nev.	1	Apl. 6	May 9	May 26	.20

*The delinquent day and the day of sale were postponed to dates given above.

Pipe Line Certificates.

The following table gives the quotations and sales at the Consolidated Stock and Petroleum Exchange:

	Opening.	Highest.	Lowest.	Closing.	Sales.
April 30.....	68c	68⅛c	66c.	66⅛c.	2,000,000
May 2	65⅞	66	65¼	66	1,451,000
3.....	65⅞	67⅛	65¾	65⅞	1,572,000
4.....	66¾	67	65⅛	66	2,291,000
5... ..	66¼	66¾	65¾	66⅝	1,410,000
6.	66⅞	66⅞	65⅞	66⅛	840,000
Total sales in barrels.....					9,564,000

Baltimore Stock Quotations.

COMPANY.	H.	L.
Atlantic Coal.....	*$1.70	†$1.65
Baltimore & N. Carolina.....	* .65	† .57
Conrad Hill	* .25	† .20
George's Creek Coal.....	*90.00	†80.00
Lake Chrome.....	† .10	† .10
North State (Balt.).....	* .65	† .55
Ore Knob.....	* .14	† .11
Silver Valley.....	* 2.25	† 2.10

† Bid. * Asked.

Highest and lowest prices bid and asked during the week ended May 5th.

Birmingham, Ala., Stock Quotations.

The Birmingham Stock Exchange, to the organization of which we referred in our issue of April 16th, opened for active business on the 29th ult. A number of the leading Southern companies have been listed; and a large business will undoubtedly be done in many of the stocks.

	Highest.	Lowest.
Avondale Land Company	*$25	*$25
Alabama Connellsville C. & C.....	*100	*100
Alabama Asphalt.....	.....	.....
Bessemer Land Co	*56	*56
Belt Road Land Co.....	*40	*40
Brooklyn Land Co	.....	.....
Birmingham Min. & Mfg. Co	†155	†155
Birmingham Ensley.....	*21½	†20⅛
Chattanooga E. E. Land Co	.....	.....
Central Land & Imp. Co.....	.....	.....
* Coalburg Coal & Coke Co.....	.....	.....
Debardieben C. & I. Co.....	.....	.....
Decatur Land & Imp. Co.....	†20	†20
Elyton Land Co	.....	.....
E. Birmingham Land Co	*45	†45
East Lake Land Co	*200	†150
Ensley City Land Co.....	*13½	*13⅛
Enterprise Mfg. Co.....	*101	*101
Glendale Land Co.....	*70	*70
Highland Lake Land Co.....	*80	*80
Sloss Iron & Steel Co	.....	.....
† Sloss Iron & Steel Co	*95	*95
Sheffield Coal & Iron Co	*162½	*162⅛
Selma Land & Imp. Co	.....	.....
Tuscaloosa C. & I. Co., paid.....	†90	†90
§ Tuscaloosa C. & I. Co.....	†30	†30
West End Land Co.....	*235	*235
Woodstock Steel & Iron Co.....	.....	.....

* Bid. † Asked. ‡ Bonds. § 30 per cent paid.

Highest and lowest prices during the week ended May 3d.

Boston Mining Stocks.

[From our Special Correspondent.]

BOSTON, May 5.

There is but little to be said about the market this week. The copper stocks seem to be subsiding to a lower level, and there is but little disposition to operate in them on either side of the market. In fact, orders to buy or sell are limited, holders being disposed to wait and see what the outcome of the recent sale of ingot is likely to be, and buyers are holding off for lower prices. Result, a dull and stupid market. Calumet & Hecla holds its price well in view of the situation, selling up to 212 and receding to 209 as the latest sale—132 shares changed hands, which is pretty good for this stock. Tamarack is steady, with sales at $90.

Quincy declined $1 to $46, with sales of less than 100 shares. Franklin is weaker and declined to $10⅛, but less than 200 shares were sold at $10⅛@$10⅜. Holders of Franklin generally are not disposed to part with their stock at these prices, and we believe that stock bought now will pay a handsome profit before the snow flies again. Atlantic declined from $10 to $9, at which price 100 shares only were sold. Osceola also declined from $25 to $24 on sales of 200 shares.

Huron declined to 75c. The balance of list is entirely neglected.

Ironton Iron sold at $9⅛, but declined later to $8¼.

In the silver stocks, Napa advanced to $1⅜, Bonanza steady at $1½@$1⅝; Boston & Montana sold at $4; Catalpa, 27½@30c.; Crescent, 10@12c.; Dunkin firm and in good demand at 40c.; "Cusi" heavy on reorganization notice, which means assessments in the future.

Later.—Huron sold at 37½c.; Ironton at $8; Calumet & Hecla at $210. Market heavy.

Deadwood-Dakota Mining Stocks.

Company:	H.	L.	Company:	H.	L.
Bullion	.10	.05½	Mutual..... ...	.05½	.03¾
Centre Shot.....	.03	.01⅞	Pocahontas. .	.02½	.01⅛
Eureka.....	.10	.06¼	Rattler.....	.32	.25
Enterprise... ..	.03	.01½	Ruby Bell.....	.03	.02⅛
Hester A... ...	.20	.10	Seabury Calkins	.25	.17
Iron Hill.....	2.10	1.80	Seg. Iron Hill..	.14	.10
Liberty	.03	.02	Uncle Sam.....	.75	.75
Minna	.02½	.01½	U. S. Grant.....	.05	.01
Mugwump.....	.02½	.01½	West Virginia..	.16	.14

Highest and lowest prices bid and asked during the week ended April 30th.

London Stock Quotations of American Mines.

COMPANY.	Highest.	Lowest.
Alturas Gold, Idaho.....	17s. 6d.	12s. 6d.
California Gold, Colo.....	6s.	5s. 6d.
Carlisle, N. Mex	£1¼	£1
Colorado United, Colo.....	£1	£⅞
Denver Gold, Colo...	2s. 6d.	2s.
Eberhardt, Nev	8s. 6d.	7s.
Empire, Mont.	£3⅝	£3 5-16
Flagstaff, Utah.....	5s.	4s.
Garfield, Nev...	27s. 6d.	21s. 3d.
Gold Hill, N. C.....	2s. 6d.	2s.
Hoover Hill, N. C.....	2s 6d.	1s. 6d.
La Plata, Colo..... ...	6s.	4s. 6d.
Montana Lt., Mont	£8⅞	£8¼
New Emma Silver, Utah.....	5s. 6d.	4s. 6d.
Plumas Eureka, Cal.....	£¾	£⅛
Richmond Con., Nev.....	£5⅛	£4⅞
Ruby & Dunderb'g, Nev..... ...	8s. 6d.	6s. 6d.
Russell Gold, N. C.....	8s.	7s.
Sierra Buttes, Cal...	£1¼	£1
Union Gold	£1⅜	£1⅛
U. S. Gold Placer, Colo.....	£1	£¾
Viola Lt., Idaho	£2½	£1⅞
Quoted in Paris.		
Lexington, Mont.....	†45.50	†45.50
" (organizers' shares).....	†2.50	†2.50

† Francs.

Highest and lowest prices during week ended April 23d.

Gogebic Iron Stocks.

The market has been dull at prices named for small lots. Good reports are received from the Range, and as soon as the lake opens quite an advance on the present prices may be expected for the shipping mines. The second body of ore recently struck on the 200-foot level of the Sunday Lake mine is said to be more than 25 feet wide, making at least 60 feet of soft Bessemer ore at that point. This property and the Iron Chief adjoining are expected to become large shippers of ore this summer.

NAME.	No. of shares.	Pres't value.	NAME.	No. of shares.	Pres't value.
Aurora 100,000		$20.00	Laura	40,000	$2.50
Anvil	40,000	12.00	Montreal	20,000	32.00
Amazon	40,000	4.25	Moore	40,000	3.50
Ashland.....	40,000	40.00	Mikado.....	40,000	3.00
Agogebic ...	40,000	2.00	Minnewawa..	40,000	4.50
Atlantic	40,000	5.00	Nimikon ...	40,000	10.00
Berringer...	100,000	2.50	Nort'rn Chief	30,000	125.00
Bonnie.	40,000	7.50	Norway. ..	20,000	2 50
Blue Jacket.	40,000	5.00	Norrie	30,000	50.00
Black River..	20,000	20.00	Odanah	20,000	11.25
Bessemer....	20,000	9.00	Old Nokomis	40,000	2 00
Brotherton..	80,000	5.50	Pabst.....	250	2.000
Bourne	40,000	4.25	Puritan.....	40,000	22.00
Crown Point.	100,000	1.75	Pence & Snyder I. D.Co.	100,000	4.00
Caledonia....	40,000	3.00	Pence.....	40,000	5.00
Colby.....	*	*	Penokee & G. D. Co	5 000	775.00
Emma	40,000	3.00	Palms.....	40,000	7.00
Father Hennepin.....	40,000	4.00	Prospect Hill	40,000	3.00
First Nation'l	80,000	3.75	Ryan	40,000	5.50
Flor'ce May.	40,000	2.75	Superior. ...	100,000	3.50
Germania ...	40,000	13.75	Section 33 Co	20,000	10.00
Gogebic I. Sy	200,000	3.25	Sunday Lake	40,000	7.75
Gogebic R. & I. Co. (fee)..	40,000	5.00	Snider	40,000	5.00
Gogebic .	40,000	2.00	Trimble	40,000	7.00
Iron King. ..	40,000	18.00	Tontine	40,000	3.00
Ironton.....	40,000	12.00	Union	40,000	3.25
Iron Prince..	40,000	3.00	United I. & L. Syndicate	200,000	.60
Ironsides	40,000	2.50	*W. L. & Min'l	90,000	1.00
Iron Chief...	40,000	4.50	Valley	120,000	3.50
Kakagon	40,000	12.50			

*See Penokee & Gogebic Development Company. † Includes fee.

The shares of the above companies all have a par value of $25, excepting the Pabst, the Penokee & Gogebic Development Company, and the Northern Chief, which are $100 par, and the Superior and Wisconsin Land and Mineral Company, $10 par.

St. Louis Mining Stocks. May 4.

[From our Special Correspondent.]

The market during the last two weeks has had a declining tendency, and we quote all stocks which are traded in here at lower figures. The only exception to this rule has been Hope stock, which, under a good demand, assisted by good reports from the mine and unusually large bullion shipments, has steadily advanced until it sold at $8 per share. It has been somewhat quieter the last few days, and we quote it to-day at $7.50 bid, $8 asked. The heaviest decline of the so-called legitimate stocks was experienced by Yavapai. Frightened by the report that the mill, at present working on the dumps, would have to stop for lack of water, and that the company was under the necessity of raising additional funds in order to pump and pipe the water from a distance of over two miles, some large holders began to unload, and this fact becoming known, was taken advantage of, and the stock hammered until it had reached 50 cents per share. At this figure, however, new buyers appeared, and bid that price for any part of 20,000 shares. This infused new confidence, and the report that all the money necessary had been raised by the company through voluntary subscriptions of the larger stockholders steadied the market, and the price slowly advanced again to 60c. bid 65c. asked. We consider this stock very cheap at present figures, and as possessing more intrinsic merit than any of the so-called cheap stocks. We should not be surprised to see this property take rank before very long as a regular dividend payer. Influenced by the general declining tendency, Granite Mountain mining stock has also been weak, and under small offerings declined to $58, at which price a few sales were made. At this point rumors, which seem to be well authenticated, became current that the directors of the company were seriously considering the erection of an additional 100-stamp mill, and as the developments and reports from the property had always been of the most favorable character, the calculation that with the erection of such an addition the dividends could easily be increased from 50c. to $1 or even $1.25 per month, seemed reasonable, and under renewed orders to purchase the shares, advanced again, until to-day we quote same at $61½ bid, ex dividend of 50c., for which books closed yesterday. We append quotations for all other stocks. The general dullness which we reported for some time has not given place as yet to any remarkable activity.

COMPANY.	Bid.	Asked.
Adams, Colo	$2.50	$2.75
Cleveland, Colo..... ...	.20	.25
Granite Mountain, Mont.....	61.50	62.50
Hope, Mont.	*7.50	*8.00
Ideal, Colo.	.57½	60
Peacock, N. Mex.	.75	.90
Quincy, Colo.....	.....	.03
Sheridan, N. Mex..	.27½	.30
Small Hopes Cons., Colo.	7.00	7.50
St. Louis & Mex. Imp., Mex....	.75	.85
St. Louis & Yavapai, Ariz.....	.60	.65

* New stock. Par value, $10.

Pittsburg Stock Quotations.

COMPANY.	H.	L.	Closing
Alleghany Gas Co.....	$37.00	$35.00	$35.00
Bridgewater Gas	113.00	110 00	110.00
Chartiers Valley Gas Co....	89.50	88.50	89.00
Chartiers Block Coal Co....	40.00	40.00	40.00
Consignee Mining Co.....	.40	.10	.40
La Noira Mining Co.....	6.37	4.87	6.00
Manufacturers Gas Co .	41.00	39.00	41.00
Natural Gas Co. of West Va.	100.00	98.50	98.50
N. Y. & Cleve. Gas Coal Co.	46.00	46.00	46.00
Philadelphia Co.....	54.50	53.00	53.75
Pittsburg Gas Co.....	55.00	54.00	54.00
Silverton Mining Co.....	1.50	1 50	1.50
South Side Gas Co	27 50	27 50	27.50
Tuna Oil Co....	67.00	65.00	67.00
Westinghouse Air-Brake Co.	115.00	110.00	110.00
Westinghouse Brake Co ...	55 00	54.00	55 00
Wheeling Natural Gas Co...	41.75	41.00	41.50
Yankee Girl Mining Co.....	9.50	8.00	8.00

Highest and lowest prices during the week ended May 5th.

* Ex-dividend.

Auction Sale of Stocks.

The following securities were sold at auction in this city on the 4th inst.: $12,000 Central Railroad of New Jersey 6 per cent debenture bonds, due 1908, 99½ to 99¾; $17,000 Buffalo, Bradford & Pittsburg RR. 1st mortgage 7 per cent bonds, due 1896, guaranteed by Erie Railroad, 107 to 108; 20 shares Morris & Essex RR. Co., 139½; 110 shares New York, Lackawanna & Western RR. Co., 105½; $500 New York, Lake Erie & Western RR. second consolidated mortgage bonds, due 1959, 100¾; $60 New York, Lake Erie & Western Co. fractional funded coupon certificate of 1885, $40; 1 share Central Mining Company, of Michigan, $17; $300 New York, Lake Erie & Western RR. income bond, 79¾; $11,000 Buffalo, New York, & Erie RR. 1st mortgage 7 per cent bonds, due December 1st, 1916, 138¾; 19 shares Buffalo, New York & Erie RR., leased to Erie Railroad Co. at 7 per cent., 123½; $1000 Philadelphia & Reading RR. reorganization receipt for convertible 7 per cent bond, 53¼; $1000 Philadelphia & Reading RR. reorganization receipt for convertible 7 per cent bond, 50¼.

GRANITE MOUNTAIN,
SMALL HOPES,
ADAMS,
WEST GRANITE,

and other Mining Stocks bought and sold. Correspondence solicited. SAMUEL A. GAYLORD & CO.,
Stock Brokers, St. Louis, Mo.